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Technical Report 1-210

PRELIMINARY ANALYSES OF NEEDS AND PROJECTS FOR AN INTERIM TRANSPORTATION MASTER PLAN IN PENNSYLVANIA TO 1975

prepared for

The Governor's Committee for Transportation
Commonwealth of Pennsylvania

Technical Advisory Committee Operational Project 6a

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Technical Report 1-210

PRELIMINARY ANALYSES OF NEEDS AND PROJECTS FOR AN INTERIM TRANSPORTATION MASTER PLAN IN PENNSYLVANIA TO 1975

by

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August 5, 1968

prepared for

The Governor's Committee for Transportation
Commonwealth of Pennsylvania

Technical Advisory Committee Operational Project 6a

THE FRANKLIN INSTITUTE RESEARCH LABORATORIES
SYSTEMS SCIENCE DEPARTMENT

NOTICE

The opinions, findings and recommendations expressed in this report are the authors' and do not necessarily reflect those of the Governor's Committee for Transportation.

FOREWORD

The Interim Master Plan for Transportation described in this report was prepared by the Systems Science Department of The Franklin Institute Research Laboratories for the Governor's Committee for Transportation, Commonwealth of Pennsylvania in response to Technical Advisory Committee Operational Project 6a. The study was conducted under the direction of Dr. Thomas E. Stelson, Director of Project for the Governor's Committee for Transportation with the assistance of the Technical Advisory Committee to the Governor's Committee.

Overall direction of this study was provided by Mr. Joel N. Bloom, Technical Director of the Systems Science Department. Mr. Arno Cassel served as Program Manager and Mr. William R. Reeves as Project Leader for this study.

The Interim Master Plan presented in this report represents the culmination of three projects aimed at developing the first comprehensive master plan for transportation for the Commonwealth. It sought to identify projects and programs which would best serve Pennsylvania's transportation planning goals in the period through 1975. The report consists of two separately bound volumes.

Volume 1, the main body of the report, includes five sections. Section 1 discusses the rationale used in developing the plan. Section 2 reports on the statewide goals for transportation planning. Section 3 concerns the identification of alternative projects and programs to achieve the goals. Section 4 discusses the evaluation of the alternatives projects and programs in terms of their anticipated costs and benefits. Section 5 describes the results of the evaluation and reports on the projects selected for inclusion in the Interim Master Plan.

The appendix volume contains eight appendices. Appendix A is a state-of-the-art review of transportation technology and assesses the input of technical change on transportation in Pennsylvania. Appendix B describes those Federal funding programs which may be of significance to PennDOT. Appendix C describes existing transportation related plans and programs of State and local government agencies for the thirteen planning regions. Appendix D reviews transportation related plans and programs of private companies. Appendix E is a review of demographic trends in Pennsylvania in terms of the economic and social forces affecting each of the 13 regions in the State. Appendix F describes those sections of the State Constitution pertinent to transportation financing, control, and improvement. Appendix G contains a suggested automated management information system to support PennDOT. Appendix H includes some elements of the evaluation of projects and programs for the Interim Master Plan and detailed evaluations of four projects.

Acknowledgments

The authors wish to thank Dr. Thomas E. Stelson, Director of Projects, Governor's Committee for Transportation and the members of the Technical Advisory Committee for their guidance, help and continuing interest in this program. We similarly thank those persons in the agencies of the Pennsylvania State Government who helped us by providing information included in the Interim Master Plan. Special recognition goes to Mr. Joseph R. McMurtry and Mr. Robert Shaw of the Bureau of Advance Planning, Pennsylvania Department of Highways who advised us of their plans and helped us with the mapwork. Also, the Pennsylvania State Planning Board, Bureau of Community Development, and Department of Commerce were most helpful in providing detailed information about transportation-related developments in the State.

Mr. James W. Diffenderfer, Assistant Vice President of the Penn Central Transportation Company, deserves special mention for his efforts in providing a magnetic tape which contained data on rail car movements. Other special mention goes to Mr. Robert Hoffman, Public Relations Director of Keystone AAA Automobile Club and employees of that organization who laboriously prepared trip time and distance tables which were used as an integral part of the planning process.

We are obliged to Mr. David J. Goldberg for giving us practical advice based on his experiences as Commissioner of the New Jersey Department of Transportation. We also thank the consultants who worked on other projects related to formation of a PennDOT, for assisting us in collecting data and composing thoughts. Special credit is also due to Professor Ezra S. Krendel of the University of Pennsylvania. He provided many useful ideas and added direction to the development of the Interim Master Plan.

Those at The Franklin Institute Research Laboratories who contributed greatly to this effort include Mr. Jacob Grauman and Mrs. Mary Doran for their work in reviewing the state-of-the-art in transportation technology, Mr. Donald P. Stein for his efforts in processing the data used for development of the Interim Master Plan and Dr. Albert G. D. Levy for providing information on federally-sponsored programs of significance to a PennDOT.

The authors also wish to thank the computing and publications groups for their helpful assistance. Mr. Allen Lehner deserves special mention for the many hours he spent in searching through documents for the information which proved to be so useful to this project. Messrs. Anthony Kastor and Richard Gosweiler, Miss Orlinda James and Mrs. Dorothy Sheikholeslami handled much of the computational burden and preparation of tables. Miss Nancy Hardy is singled out for the creative art work. Finally, the authors thank Mr. Bernard Epstein for supervising the preparation and production of this report and Mmes. Elaine Abonyi, Marsha Adams and Diana Krigelman and the Misses Judith Anderson, Gloria Martinas, Judith Perzan and Dorothy Warrington for typing this manuscript.

SUMMARY

Renewed industrial vigor, effective use of natural resources and success in promoting statewide development -- all depend significantly on how well Pennsylvania's transportation system anticipates and performs its supporting functions. This is the challenge addressed by this Interim Master Plan for Transportation in Pennsylvania: to direct and encourage, through planning, modifications and adjustments in Pennsylvania's transportation system that will further the economic, social, and strategic objectives of the Commonwealth.

The project reported in these two volumes represents the Commonwealth's first attempt to meet this challenge. As a first attempt, it suffers from several deficiencies. It is obvious that a realization of the goals of the future must be founded on a clear understanding of the problems of the present. But our ability to analyze, measure, and project the performance of present and postulated future transportation systems -- so essential to constructive solution of a wide range of questions and decisions related to transportation -- is presently inadequate. Development of a truly comprehensive and definitive plan must await the collection of vital information and the implementation of a sophisticated methodological framework for long-range transportation planning. However, the forces of change cannot be halted while data is gathered and techniques refined. Planning must proceed with limited data and simple methodologies in the interim.

The process of developing this plan started with the consideration of transportation planning goals for the Commonwealth. It continued by identifying alternative projects and programs for achieving the goals and evaluating them with respect to their anticipated costs and benefits. Since the relative "value" attached to various planning goals was a principal factor in determining which projects were selected, several alternative development policies were given major priority: (1) Improvements in Transportation Service; (2) Economic Development of the Commonwealth; and (3) Social Development - "Making Pennsylvania a Better Place to Live". The results of these evaluations are given in the table which lists the projects recommended in the Interim Master Plan. Those projects which were selected under all three assumptions about goal values and under both budget levels assumed for the new PennDOT were clearly preferred. They were included as "Highest Priority Projects" in the recommended plan. Those projects that were selected under some goal-value and budget combinations, but not under others, were defined as "Second Highest Priority Projects"; their execution will depend on the relative goal values which the Commonwealth wishes to emphasize and the funds which it wishes to make available to PennDOT. Those projects which were rarely or never selected under any assumption about goal values or budget levels are listed under "Lowest Priority Projects".

Assuming that PennDOT will be able to continue spending at the current level of the Pennsylvania Department of Highways, approximately $2.0 billion in State funds will be available for new projects in the period to 1975. This will permit the purchase of feasibility studies or implementation where no feasibility studies are required for all projects in the Highest Priority category and also in the Second Highest Priority category. Hence, the 72 projects in these two categories compose the recommended Interim Master Plan for Transportation in Pennsylvania to 1975. This Plan is estimated to cost approximately $1.9 billion in State funds and $4.1 billion on an overall basis. This does not include the estimated costs for implementing those projects which require prior feasibility studies. Assuming that each of the projects studied will be found worthy of implementation, it is estimated that an additional $5.0 billion in State funds and $7.2 billion in total (State plus Federal and local) funds will be required to implement these projects. Thus the total out-of-pocket investment cost for studying and implementing all 72 projects included in the Interim Master Plan is estimated to be $11.3 billion of which the Commonwealth's share amounts to $6.9 billion.

Since so large an element of subjective judgment is now -- and always will be -- involved in assessing transportation benefits, it is important that participation by legislators, governmental executives, officials of private enterprises, and public interest groups be solicited in the evaluation process. In this context, there are two distinct problems: weighting benefits and ranking goals. While many benefits are quantifiable and thus can be evaluated with precision by technical experts, the evaluation of qualitative social benefits is clearly a political problem. As such, it cannot be resolved solely by technicians or even by deference to the opinions of decision makers. The determination of transportation goals involving, as it does, the basic values of our society and the ranking of these goals is likewise a political problem, solvable only through the political process.

No one group is competent to decide which goals should dominate Pennsylvania's development or to assess the qualitative benefits of implementing alternative programs. These matters must be resolved through the political process of free, democratic debate. The recommendations of this Interim Master Plan given in this report must, therefore, be accepted with the recognition that they are based only on the evaluations of a few selected experts using arbitrary sets of goal weightings. These plans must also be evaluated in the forum of public opinion. The real utility of any transportation system to the Commonwealth lies not in the *demonstrable benefits* calculated by a systems analytic framework but in the *perceived benefits* measured by individual citizens whose economic, social, and cultural activities will be served through improved transportation.

Arno Cassel

Arno Cassel, Head
Transportation and
Safety Center

Approved:

Joel N. Bloom
Technical Director
Systems Science Department

RECOMMENDED PROJECT PRIORITIES FOR INTERIM MASTER PLAN

1. Highest Priority Projects for PennDOT**

PROJECT NO.	DESCRIPTION	PROJECT COST TO STATE (THOUSAND DOLLARS) Study	Implementation	Total	Implementation Costs for Studies	TOTAL PROJECT COST (THOUSAND DOLLARS) Study	Implementation	Total	Implementation Costs for Studies
U-4	Demonstrate Electric Cars		510	510			3,000	3,000	
U-7	Subsidize Commuter Transportation (S)	75		75	35,000	75		75	35,000
U-12	Investigate Alternative Methods of Urban Transit (S)	550		550	51,000	550		550	300,000
U-13	Sponsor Jitney Service (S)	35		35	510	35		35	3,000
H-2	Complete Major Highway Improvements		750,000	750,000			1,500,000	1,500,000	
H-7	Erie-Philadelphia Highway (S)	150		150	150,000	150		150	300,000
A-1	Promote International Flights at Pittsburgh (S)	75		75	6,250	75		75	12,500
A-2	Heliports and STOL Airports in Urban Areas (S)	150		150	150,000	150		150	300,000
A-6	Upgrade General Aviation Facilities (S)	150		150	37,500	150		150	75,000
T-1	Construct Roads - Tocks Island		22,300	22,300			44,600	44,600	
T-2	Construct Access Roads to Primitive Areas		6,250	6,250			12,500	12,500	
T-3	Construct Scenic Parkways		150,000	150,000			300,000	300,000	
G-1	New City Transportation (S)	75		75	750,000	75		75	1,500,000
L-3	Change General Order 29 (S)	15		15	75	15		15	75
TOTAL		1,275	929,060	930,355	1,180,335	1,275	1,860,100	1,861,375	2,525,575
2. Second Highest Priority Projects for PennDOT**									
R-1 to R-11	Keystone Corridor (S)	300		300	3,000,000†	300		300	3,000,000†
R-12	Upgrade Rails and Equipment - Harrisburg to Philadelphia (S)	150		150	143,000	150		150	143,000
R-13 to R-16	Improve Harrisburg Terminal (S)	150		150	2,125†	150		150	12,500†
R-17	Improve Selected Rail Stations		32	32			190	190	
R-18	Intermodal Freight Terminal at Philadelphia (S)	75		75	17,500	75		75	35,000
R-19	Intermodal Freight Terminal at Pittsburgh (S)	75		75	17,500	75		75	35,000
R-20	Intermodal Freight Terminal at Harrisburg (S)	75		75	6,250	75		75	12,500
R-21	Intermodal Freight Terminal at Wilkes Barre-Scranton (S)	75		75	6,250	75		75	12,500

See footnotes on last page of Table.

2. Second Highest Priority Projects for PennDOT (Continued)

R-22	Intermodal Freight Terminal at Erie (S)	75		75	6,250	75		75	12,500
R-23	Grade Crossing Elimination (S)	35		35	150,000	35		35	300,000
U-1	Hovercraft on Rivers (S)	75		75	510	75		75	3,000
U-2	Build Rail Link between Terminals - Philadelphia		8,500	8,500			50,000	50,000	
U-6	Aerial Tramway at Pittsburgh (S)	150		150	2,125	150		150	12,500
U-8	Help Buy 275 Buses - Pittsburgh		272	272			1,600	1,600	
U-9	Help Buy 300 Buses - Philadelphia		298	298			1,750	1,750	
U-10	Help Buy Buses - Other Cities		145	145			850	850	
U-11	Help Buy 60 Rail Cars - Philadelphia Commuter Service		2,754	2,754			16,200	16,200	
U-14	Railroad Right-of-Way Availability - Philadelphia and Pittsburgh (S)	300		300	51,000	300		300	300,000
U-15	Philadelphia Subway Extension		20,667	20,667			124,000	124,000	
U-16	Extend Hatboro Line		2,125	2,125			12,500	12,500	
U-18	Controversial Freeways (S)	850		850	117,750	850		850	235,500
U-19	Liberty Tubes - Pittsburgh (S)	75		75	2,125	75		75	12,500
U-20 to U-21	Skybus Study and Demonstration - Pittsburgh	75	17,000	17,075		75	100,000	100,075	
U-25	Construct 50,000 Parking Spaces, Ends of Transit Lines		17,000	17,000			100,000	100,000	
H-1	Complete Second Six-Year Highway Program		850,000*	850,000*			1,700,000*	1,700,000*	
H-4	Improve 224 Accident Locations		7,000	7,000			14,000	14,000	
H-5	Improve 614 Hazardous Locations on School Bus Routes		25,750	25,750			51,500	51,500	
H-6	Improve 452 Hazardous Locations		22,650	22,650			45,300	45,300	
I-1	Emergency Fund - Department of Commerce		3,000	3,000			3,000	3,000	
I-3	Container Terminal at Chester (S)	75		75	17,500	75		75	35,000
I-4	Philadelphia - Baltimore Barge Service (S)	75		75	6,250	75		75	12,500
I-6	Pennsylvania Land Bridge (S)	150		150	6,250	150		150	12,500
I-9	Establish Foreign Trade Zones in Pennsylvania (S)	75		75	35,000	75		75	35,000
I-10	Survey and Enlarge Clearances (S)	300		300	150,000	300		300	300,000
A-3	Pittsburgh Airport Access (S)	75		75	12,750	75		75	75,000
A-4	Construct Rail Transportation to Philadelphia Airport		3,400	3,400			20,000	20,000	
A-5	Upgrade Airport Terminal Facilities (S)	150		150	17,500	150		150	35,000

See footnotes on last page of Table.

2. Second Highest Priority Projects for PennDOT (Continued)

A-7	Reduce Airspace Congestion - Philadelphia and Pittsburgh (S)	75		75	17,500	75		75	35,000
G-2	Emergency Fund - State Planning Board		300	300			300	300	
W-1	Disposal of Dredgings from Pennsylvania Waterways (S)	75		75	6,250	75		75	12,500
W-2	Waste Pipelines (S)	150		150	17,500	150		150	35,000
W-3	Backhauling of Garbage and Trash (S)	150		150	1,500	150		150	3,000
L-1	Allow Multiple Bottom Trailers on Pennsylvania Highways (S)	150		150	300	150		150	300
L-8	Amend Constitution to Allow Pledging of State Credit (S)	35		35	150	35		35	150
TOTAL		4,070	980,893	984,963	3,810,835	4,070	2,241,190	2,245,260	4,717,450
TOTAL	Highest Priority and Second Highest Priority Projects	5,345	1,909,953	1,915,298	4,991,170	5,345	4,101,290	4,106,635	7,243,025
3. Lowest Priority Projects for PennDOT**									
R-24	Straighten Track at Philadelphia		5,950	5,950			35,000	35,000	
U-3	Build Underground Conveyor in Center City Philadelphia		2,125	2,125			12,500	12,500	
U-5	Rail Bus Demonstration		145	145			850	850	
U-17	Purchase "Skycrane" Helicopter		850	850			5,000	5,000	
U-22	Construct 2000 Parking Spaces - Philadelphia		1,700	1,700			10,000	10,000	
U-23	Construct 2000 Parking Spaces - Pittsburgh		1,700	1,700			10,000	10,000	
U-24	Construct 4000 Parking Spaces - Other Cities		2,550	2,550			15,000	15,000	
U-26	Sponsor Helicopter Rescue Service		1,500	1,500			3,000	3,000	
U-27	Exclusive Bus Lanes (S)	150		150	150,000	150		150	300,000
H-3	Release Some State Roads to Local Government(S)	35		35	300	35		35	300
H-8	Demonstrate Electronic Merge Signals		275	275			550	550	
H-9	Demonstrate Truck Weighing Devices		275	275			550	550	
I-2	Improve General Cargo Facilities - Port of Philadelphia		1,500	1,500			3,000	3,000	
I-5	Improve Coal Loading Facilities - Port of Philadelphia		1,500	1,500			3,000	3,000	
I-7	Construct Lake Erie-Ohio River Canal		106,000	106,000			1,060,000	1,060,000	
I-8	Deepen Delaware River Channel (S)	75		75	300,000	75		75	3,000,000

See footnotes on last page of Table.

3. Lowest Priority Projects for PennDOT (Continued)

L-2	Investigate Role of PennDOT in Assisting PUC/ICC (S)	35		35	150	35		35	150
L-4	Investigate Hazardous Material Movements (S)	75		75	17,500	75		75	35,000
L-5	Investigate Use of Electronic Law Enforcement Aids (S)	300		300	6,250	300		300	12,500
L-6	Reduce Air Pollution (S)	75		75	37,500	75		75	75,000
L-7	Reduce Vehicular Noise (S)	75		75	17,500	75		75	35,000
TOTAL		820	126,070	126,890	529,200	820	1,158,450	1,159,270	3,457,950
TOTAL	All Projects	6,165	2,036,023	2,042,188	5,520,370	6,165	5,259,740	5,265,905	10,700,975

†Maximum Cost for Mutually Exclusive Projects

*Since some elements of the Six-Year Highway Program will be completed under Project H-1, listed in the "Highest Priority Projects," only the cost of the remainder of the Six-Year Program is included here.

**Order of projects within each priority group is arbitrary and has no significance.

(S)Only study of these projects is recommended for Interim Master Plan; however, estimated implementation costs are shown to indicate possible funding requirements.

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SECTION 1

RATIONALE FOR DEVELOPING AN INTERIM MASTER PLAN

1-1 Introduction

Formation of a Pennsylvania Department of Transportation (PennDOT) will offer a significant new approach to deal with a variety of problems and open new opportunities to provide imaginative leadership in the development of the Commonwealth. For example, the rapid advancement of transportation technology presents unparalleled opportunity for improved movement above, on, and below the land surface. In addition, technology is providing new capabilities for wide distribution of utilities and communications facilities, and thereby employment. In the next 20 to 50 years, we can expect the virtual disappearance of existing restraints on using habitable space, if supporting technologies are coordinated with the necessary transportation facilities.

With proper planning Pennsylvania can realize early the many benefits of new transportation systems which are swift and convenient, economical and attractive and will result in

1. Enhanced economic growth, through increased employment, attraction of new industries, new business for the existing industries of the Commonwealth, and increased tourism;
2. Preservation of natural beauty and open land and provision for additional recreation areas;
3. Savings of time and money for Commonwealth citizens;
4. Faster and cheaper delivery of commodities for Commonwealth industries and citizens;
5. Better balance between transportation modes serving Commonwealth communities and more efficient use of Pennsylvania's transportation resources; and
6. Relief of urban traffic congestion and provision of comfortable and convenient means of mass transit to supplement the automobile.

Selection of the proper course of action and provision for an orderly development of the Commonwealth's transportation system will require comprehensive planning. However, as with all long-range planning, transportation planning is complicated by the uncertainties of the future. Its complexity is compounded by the necessity to consider in a single framework *all* modes of transport and everything to be moved within and between all areas. Just as transportation needs are influenced by many circumstances, so does transportation influence many other activities. Transportation follows where the people and industry go, but it also can guide the directions of such growth.

How much industry and how many people will there be in Pennsylvania in 1975? Where will they be living? How might land in the Commonwealth be used? How much, for what purposes, and between which points will people travel? How many goods and services will be produced and consumed in Pennsylvania, and from where to where will they be transported? What commodities and how much of them will be imported and exported by and through the Commonwealth? How much land will recreation require, and how much should be devoted to transportation? How can the Commonwealth's transportation resources be effectively developed and efficiently utilized as one instrument to direct Pennsylvania's growth? What will be the likely characteristics, performance, costs, revenues, and taxes of the possible land, water, and air transportation systems and networks of the future? How will these systems interface, and how will they be coordinated and integrated? How will better communications influence transportation? What are the long-range budgeting and legislative implications?

These are significant questions requiring timely answers. Recognition of these problems prompted Governor Raymond P. Shafer to form The Governor's Committee for Transportation in Pennsylvania. In his remarks at the initial meeting of this Committee, the Governor defined the major issue in stating:

> We have highway plans; we have mass transit plans; we have port development plans and waterway plans; we have airport development plans; but we lack a comprehensive transportation plan that brings together all these separate, but highly essential, plans so they make sense for Pennsylvania's future. What we need is a Master Plan for Transportation.

The Interim Master Plan for Transportation in Pennsylvania to 1975 presented in this report and developed under the sponsorship of the Governor's Committee* for Transportation is the first such comprehensive plan.

1-2 Pennsylvania's Existing Transportation System

Because of the enormous range of possibilities for new transportation systems, it was necessary to begin not with the technology, but with the problems of existing transportation networks. New transportation technologies must be matched with the Commonwealth's needs for them. As one task in the development of this Plan, an inventory of the elements and resources of Pennsylvania's existing transportation network was undertaken.† This survey of Pennsylvania's transportation infrastructure covered the facilities of the 12,334 miles of primary highways and concluded that 75,000,000 daily vehicle-miles were travelled on them in 1966; this represented about one-half of the total highway travel within the State which has a total of 112,410 miles of highway. It examined the facilities and service on the major rail routes of the twelve Class I railroads which operate 40,610 miles of rail lines in the Commonwealth. It investigated the airline service and facilities at Pennsylvania's 14 air carrier airports and examined the facilities of 463 general aviation airports. It examined the movements and harbor facilities on Pennsylvania's three major waterways and investigated the 8,655 miles of petroleum pipelines in the Commonwealth operated by thirteen companies. These major transportation facilities plus currently programmed highway construction are shown in Figure 1-1. To these statewide highway, rail, air, water, and pipeline networks must be joined the resources existing for the urban movements of pedestrians, automobiles, trucks, and public transit traffic. In addition, there are the vast

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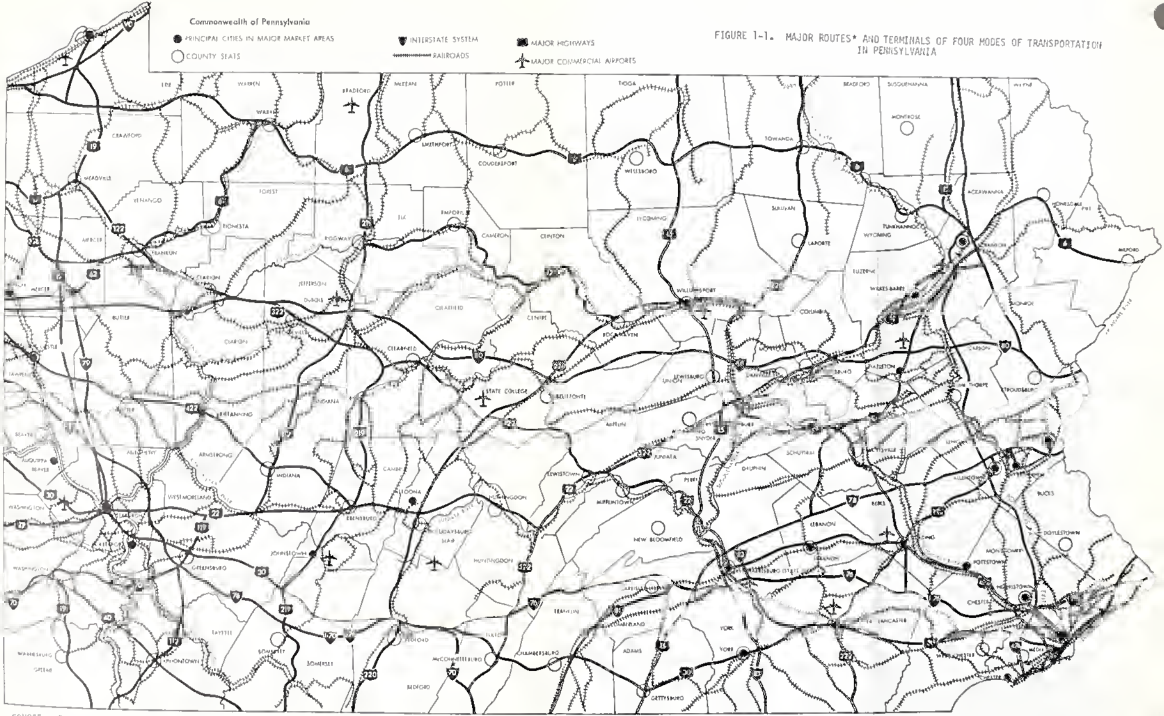
*Project 6a of the Technical Advisory Committee to the Governor's Committee for Transportation.

†Project 4 of the Technical Advisory Committee to the Governor's Committee for Transportation, Wilbur Smith and Associates, Project 4 Inventory and Adequacy of Existing Statewide Transportation Systems. Preliminary Draft Final Report, January, 1968. New Haven, Connecticut.

FIGURE 1-1. MAJOR ROUTES* AND TERMINALS OF FOUR MODES OF TRANSPORTATION IN PENNSYLVANIA



SOURCE: Department of Commerce, Commonwealth of Pennsylvania

*Interstate highways 79, 80, 81E, 84, and 95 to be completed during the early 1970s.

supplier industries and the material and human resources represented by the service industries and the governmental agencies that maintain and regulate the vehicles, highways, rail routes, airways, waterways, and pipelines, which together make up Pennsylvania's transportation complex.

1-3 Future Demands for Transport Services

The present demands upon Pennsylvania's transport system can be expected to increase greatly in the near future if current predictions in growth and output are realized. Another task in the development of this Plan was therefore concerned with projecting the demands for intercity transportation in Pennsylvania to 1975* under the assumptions that existing Commonwealth growth and modal traffic trends will continue. These "do nothing" projections are, of course, conservative, since the stimulation to Commonwealth growth that will result from a positive program of transportation planning was not considered. Even with these conservative assumptions, however, the anticipated intercity travel growth is substantial. Highway vehicular travel can be expected to increase by one-third; rail passenger travel can be expected to quadruple**; and air passenger travel can be expected to triple. The growth in freight transport will be even greater; water traffic will more than double; pipeline traffic will increase by one-third; rail freight traffic can be expected to double; truck freight can be expected to increase to two-and-one half times its current level; and air freight will grow seven-fold. These increases may be contrasted with the anticipated population growth from 11,582,000 in 1966 to 12,878,000 in 1975, which is less than ten percent and the anticipated employment growth from 4,689,000 in 1966 to 4,784,000 in 1975.

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*Project 5 of the Technical Advisory Committee to the Governor's Committee for Transportation, Sue S. Johnson, Arno Cassel, Patricia A. Ferry, *Preliminary Analyses of Intercity Transportation Demand in Pennsylvania*. Draft Final Report, March 1968, The Franklin Institute Research Laboratories, Philadelphia, Pennsylvania.

**Due primarily to a 20% annual growth rate anticipated for passenger travel in the Northeast Corridor.

1-4 The Opportunity for Growth

This dramatic growth offers the Commonwealth unprecedented opportunity and challenge. The opportunity is to effectively develop and better utilize Pennsylvania's transport resources and services to stimulate the future growth of the Commonwealth and to promote the economic prosperity and social welfare of all Pennsylvanians.

According to all the barometers of social change, this is a critical period in the Commonwealth's history. Population change is one measure of prosperity. Over the years, an increasing rate of out migration of Pennsylvania's vital young people has been the significant determinant of Pennsylvania's low population growth. Between 1950 and 1960, 418,000 people left the State. If these individuals had remained in the State, population growth during the last decade would have been approximately 51% greater. Furthermore, the U.S. Bureau of the Census anticipates that more than one half-million people will leave Pennsylvania in this decade.

Of equal concern is the declining industrial base of the State. Technological advance has brought about the use of many production processes which do not require extensive use of the raw materials which originally brought Pennsylvania to national prominence. Additionally, the relationship of raw materials to plants and markets has also changed. In brief, Pennsylvania is located amidst a wealth of natural resources that no longer play the pivotal role in the nation's economy that they enjoyed in the early decades of this century. In fact, Pennsylvania now has more counties that qualify as part of the chronically depressed Appalachian Region than any other state. It is therefore vital that the Commonwealth adapt to the requirements of industries at the national forefront and to the demands of a service-oriented economy. Certainly, unprecedented opportunities for growth will exist in the coming decades. Pennsylvania has always been "The Keystone State," but this has never been of greater importance to the Commonwealth than it is today. Pennsylvania can now anticipate the intersection of three of this nation's eight major megalopolitan centers within its borders by the turn of this century, as illustrated by the growth patterns shown in Figure 1-2. Pennsylvania's location can be its greatest asset if plans are made now to capitalize on this development.

1-5 The Challenge to Planning

Renewed industrial vigor, effective use of natural resources, and success in promoting statewide development - all depend significantly on how well the transportation system anticipates and performs its supporting functions. This is the challenge: to direct and encourage, through planning, modifications and adjustments in Pennsylvania's transportation system that will further the economic, social, and strategic objectives of the Commonwealth.

This project* to develop a Master Plan for Transportation in Pennsylvania to 1975, to guide the proposed new Pennsylvania Department of Transportation (PennDOT), represents the Commonwealth's first attempt to meet this challenge. As a first attempt, it suffers from several deficiencies. First, it is clear that a realization of the goals of the future must be founded on a clear understanding of the problems of the present. The ability to analyze, measure, and project the performance of present and postulated future transportation systems is essential to constructive solution of a wide range of questions and decisions related to transportation. It was originally intended that the survey of Pennsylvania's transportation infrastructure and the studies of future transportation demand in the Commonwealth would meet this need. However, the severe pressures of time and limitations of existing data precluded their accomplishing all of their original aims.

Despite these deficiencies, the infrastructure survey and the demand forecasts do form a starting point. When projected future demand is compared with the existing capacity in each mode, certain deficiencies are uncovered. The major defect is that each mode was studied in isolation.

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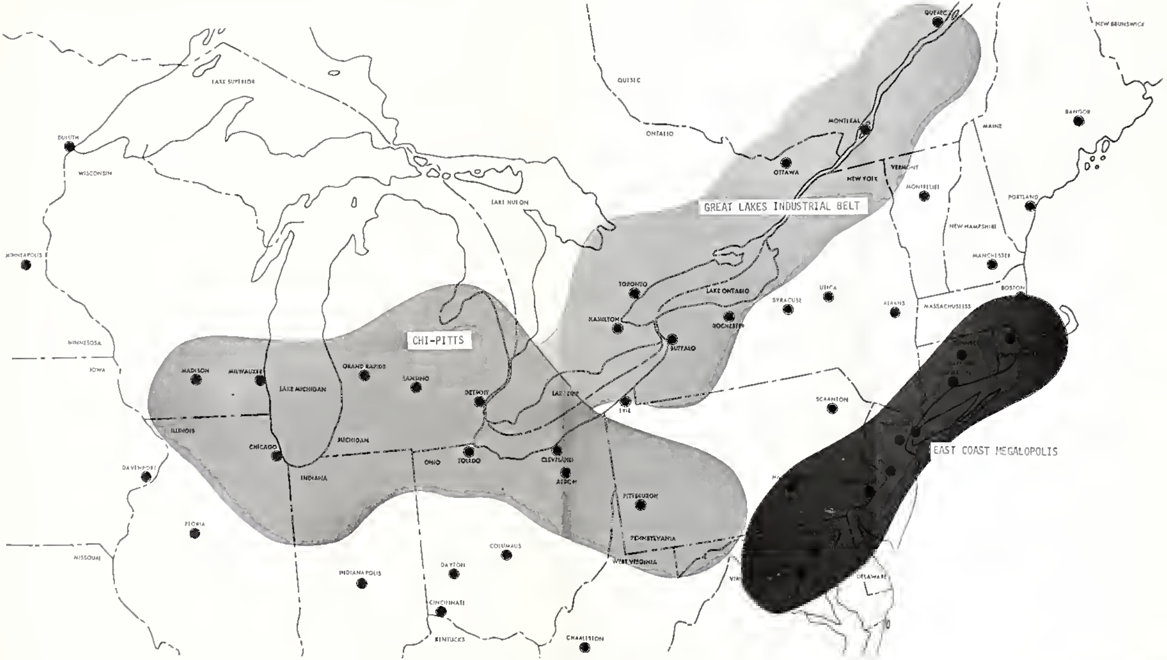
*Project 6a of the Technical Advisory Committee to the Governor's Committee for Transportation.

FIGURE 1-2 PENNSYLVANIA's LOCATION WITH REFERENCE TO MEGALOPOLITAN SETTLEMENTS



SOURCE: Department of Commerce, Commonwealth of Pennsylvania

As emphasized earlier, the principal purpose of a master plan for transportation is to guide all major transportation decisions of state-wide impact and to bring all modal planning together in one comprehensive framework.

Unfortunately, the creation of a truly comprehensive plan is precluded at the present time. Existing data are quite inadequate to support a really comprehensive planning methodology which will forecast the interactive growths in socio-economic activity and demands for transportation services. Furthermore, the scope of work leading to the development of this Plan excluded a detailed survey of the urban transportation infrastructure and the required analyses of demand for transportation service in urban areas. Since 80% of the Commonwealth's population will live in urban areas in 1975, there is a serious gap in the background studies which support this plan. Additionally, consideration of technical developments in the post-1975 era which must be evaluated by PennDOT studies and demonstration projects in the period before 1975 was also omitted from the background studies and, therefore, covered in a special task for development of this Plan. All of these deficiences make it clear that full realization of the task started here must await the complete implementation of The Methodogical Framework for Comprehensive Transportation Planning developed for the Governor's Committee.* We can only start the process of developing a transportation master plan so that decisions can be made in the interim period until the framework is fully implemented and the new Pennsylvania Department of Transportation (PennDOT) is fully operational. Thus, this effort has been directed at formulating an *Interim Transportation Master Plan to 1975*.

1-6 Rationale of The Interim Master Plan

The rationale used for development of this Plan is illustrated in Figure 1-3. As shown in the Figure, the planning process starts with a

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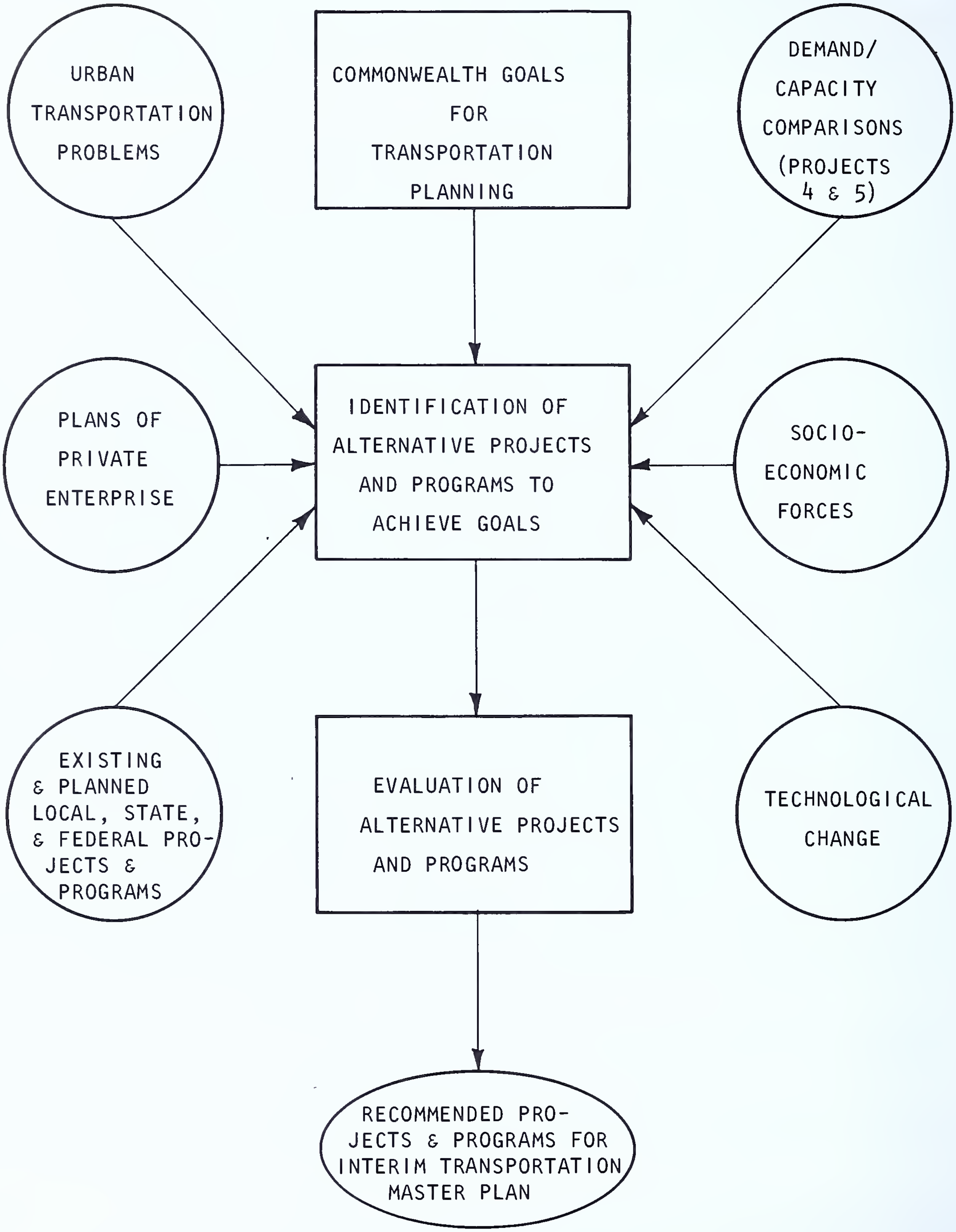
*Project 6b of the Technical Advisory Committee to the Governor's Committee for Transportation. Transportation Research Institute, Carnegie-Mellon University and Tranportation Research and Traffic Safety Center, Pennsylvania State University, Methodological Framework for Comprehensive Transportation Planning, Parts I and II, Draft Final Report, May 1968.

Figure 1-3. Rationale of the Interim Master Plan


URBAN TRANSPORTATION PROBLEMS
COMMONWEALTH GOALS FOR TRANSPORTATION PLANNING
DEMAND/ CAPACITY COMPARISONS (PROJECTS 4 & 5)
PLANS OF PRIVATE ENTERPRISE
IDENTIFICATION OF ALTERNATIVE PROJECTS AND PROGRAMS TO ACHIEVE GOALS
SOCIO-ECONOMIC FORCES
EXISTING & PLANNED LOCAL, STATE, & FEDERAL PROJECTS & PROGRAMS
EVALUATION OF ALTERNATIVE PROJECTS AND PROGRAMS
TECHNOLOGICAL CHANGE
RECOMMENDED PROJECTS & PROGRAMS FOR INTERIM TRANSPORTATION MASTER PLAN

consideration of the overall goals for transportation development in the Commonwealth. Even though no formal list of goals for Pennsylvania currently exists, we have, nevertheless, started our development of this Plan with a specification of some of the goals expressed or implied by executives of State Government. These goals are discussed in Section 2 of this report.

As shown in Figure 1-3, the second step in the development of the plan, discussed in Section 3, involved searching for those projects and programs which would serve to meet the transportation planning goals. Originally, it was intended that a comparison of the projected demands for intercity transport with the capacity of existing systems would suffice to define the elements for the master plan. However, it became clear that matching of demand with capacity of the existing infrastructure was not sufficient for development of a comprehensive plan. Consideration must also be given to the serious urban transport problems facing the Commonwealth whose solution will require participation and support in PennDOT projects and programs. Further, it was recognized that socio-economic forces also dictate transportation needs which must be incorporated in the projects for the master plan. Additionally, the plans of local, State, and Federal Government agencies and private enterprise which require State approval or support must also be considered in the formulation of the master plan. Finally, new technology will make possible new solutions to transport problems and also raise new problems for PennDOT to solve; the recommended master plan must prepare PennDOT to anticipate these problems and to manage technological change to serve the goals of the Commonwealth.

The third step in the planning process shown in Figure 1-3 was concerned with evaluation of the alternative projects and programs to select those that will best serve the Commonwealth's transportation planning goals, given a limited budget for initiating new projects. This evaluation required an estimation for each proposed project of the anticipated benefits in terms of goal achievement and the out-of-pocket investment costs to the State. These estimated benefits and costs were then used to rank and select projects for PennDOT, using an available computer program, under different assumptions about the budget for new projects available to PennDOT, according to the evaluation logic described in Section 4 of this report. Since the relative "value" attached to various goals is a principal factor in determining which projects are selected, several alternative development policies were given major priority: (1) Improvements in Transportation Service; (2) Economic Development of the Commonwealth; and (3) Social Development - "Making Pennsylvania a Better Place to Live". The results of these evaluations are given in Section 5 which lists the projects recommended in the Interim Master Plan. Those projects which were selected under all assumptions about goal values and all budget levels, were clearly preferred and hence are included as "Highest Priority Projects" in the recommended plan. Those projects which were selected under some goal-value and budget combinations, but not under others, were defined as "Second Highest Priority"; their execution depends on the relative goal values which the Commonwealth wishes to emphasize and the funds which it wishes to make available to PennDOT. Those projects which were rarely or never selected under any assumption about goal-values or budget-levels are listed under "Lowest Priority Projects".

On this first effort at developing a master plan, it is, of course, unlikely that all of the goals and objectives which might be served by transportation development have been treated in sufficient depth. Further, the task of specifying projects and programs of interest to PennDOT has also suffered from limitations of time for field work. Nevertheless, a first attempt has been made at providing goals with projects appropriate to their achievement. While the analysis and ranking of the projects will provide some guidance for initial actions by a PennDOT, the important point is that this approach illustrates a methodology for evaluation which can be used until the more sophisticated methodology is available. Goals must be specified, in the interim, and the contributions of various projects to their achievement must be evaluated. Since so large an element of subjective judgment is now - and always will be - involved is assessing transportation benefits, it is important that participation by legislators, governmental executives, officials of private enterprises, and public interest groups be solicited in the evaluation process. No one group is competent to decide which goals should dominate Pennsylvania's development or to assess the benefits of implementing alternative programs. These matters must be resolved through the political process of free, democratic debate. The recommendations of this Interim Master Plan must therefore be accepted with the recognition that they are based only on the evaluation of the experts in the Technical Advisory Committee to the Governor's Committee for Transportation and The Franklin Institute Research Laboratories; they must also be evaluated in the forum of public opinion by the citizens of the Commonwealth whose economic, social, and cultural activities will be served through improved transportation.

SECTION 2

STATEWIDE GOALS FOR TRANSPORTATION PLANNING

The first step in developing this Interim Master Plan is concerned with defining the objectives and goals which transportation development should serve. Since a formal list of goals and priorities to guide Pennsylvania's future development does not currently exist[*], it has been necessary to develop one for this study. Unfortunately, very little guidance has been gained in this task from other transportation planning efforts; in most transportation planning efforts to date, goals have not been defined at all or have been defined in the limited terms of minimizing total transportation dollar costs. The logical recourse in this situation has been to try to anticipate the kinds of consequences of transportation changes which are relevant to the formulation of a comprehensive and statewide Master Plan, and this is the approach which we have followed.

Fundamentally, Pennsylvania's transportation system, like other public improvements, exists for the purpose of serving the citizens and industries of the Commonwealth. To get at the relative worth of a particular transportation project, it is therefore necessary to ask Mr. Citizen how he would evaluate the project for himself. Doubtless he would ask at least some of these questions:

> Will it serve me? My family? For which trips? How much time will it save me and my family? Will it allow me a greater range of places to live while still holding the same job? Allow me to take another job without moving my home? How convenient will it be?

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[*] A Governor's Commission on Goals and Priorities for Pennsylvania is currently addressing this issue.

> How safe? How comfortable? How much will it cost me to use it or not to use it? How will it affect my property visually, physically, and socially, both now and in the future? From similar standpoints, what about the effect on my neighborhood, my city, and my state?

Of course, each individual and family in the Commonwealth will weigh these points in different ways, in accordance with the hierarchy of their own personal value systems. While a complete list of these personal values certainly would be long and doubtless diverse, there are some goals that are probably shared in common among most of Pennsylvania's citizens: personal security, freedom to choose values and pursue goals, social opportunity, physical and mental development, accumulation of knowledge, physical comfort, serenity, happiness, physical pleasure, meaningful human relationships, acquisition of material goods, and sense of personal worth.

If Pennsylvania is to provide an environment which encourages the maximum fulfillment of such personal goals, consistent with necessary constraints on socially undesirable acts, then the collective goals of public agencies in the Commonwealth must reflect these personal values. Clearly then, monetary or economic concerns are but one area whose values must be reflected in planning goals.

Given the complexities of dealing with all modes of transportation and the wide range of social impacts which transportation changes can bring about, it is clear that the goals used to evaluate projects for this plan must be based on the broadest possible aims for the Commonwealth and rooted in the basic values of its citizens.

We have therefore abstracted the following list of goals for transportation planning, most of which were stated or implied by executives of State Government.

Transportation Service Goals

- Increased capacity for moving people and goods
- Increased speed (decreased travel times)

- Improved comfort and convenience to users
- Improved reliability of public carriers
- Affordable costs to users of mass transit
- Improved flexibility to handle peak loads

Fiscal Goals

- Reduced transportation system costs (e.g., total revenues minus investment plus operating costs)
- Improved fiscal efficiency
- Increased resource utilization

Safety Goals

- Improved safety

Economic Goals

- Increased industrial development
- Increased employment
- Improved development patterns (e.g., improved employment in Appalachia)
- Reduced distribution costs
- Increased property values
- Reduced taxes
- More equitable income distribution

Land Use Goals

- Maintenance of open-space
- Preservation of natural beauty and historical sites and buildings
- Provision of additional park and recreational facilities
- Increased industrial and commercial development in selected areas

Social Goals

- Reduced levels of air pollution
- Reduced levels of noise
- Decreased disruption of neighborhoods and communities
- Increased happiness and well-being due to greater opportunities for interaction
- Improved asthetics (e.g., improved landscape)

Since goals are the ends to which planned courses of action are directed, it has been necessary to define them in operational terms so that either the existence or non-existence of a desired state or degree of achievement can be established.

Based on the above considerations, we have defined the following sixteen general goals which seem most appropriate for PennDOT planning, shown in Table 2-1.

Table 2-1

Recommended Goals for PennDOT Transportation Planning

Transportation Service Goals

- Provide sufficient capacity to meet transportation requirements when private capital or private equipment is not available to do so.
- Improve the speed of transport for freight and passengers to decrease the travel time.
- Improve comfort and convenience of transport for passengers and the convenience of freight movement to shippers.

Fiscal Goals

- Reduce the cost and increase the efficiency of transport.

Safety Goals

- Identify safety hazards related to transportation and take steps to reduce the hazards or eliminate them.

Economic Goals

- Provide more employment in Pennsylvania.
- Upgrade the skills and educations of Pennsylvanians and increase their annual incomes.
- Stabilize the economy of the state by keeping the industrial base in the state diversified; encourage development of the service industries.
- Resurrect the competitive free enterprise spirit which touched off Pennsylvania's economic growth in the 19th Century.

Land-Use Goals

- Add transportation facilities to provide access to open space and increase the use of recreational facilities.
- Increase industrial land use in chronically depressed areas of the Commonwealth.

Table 2-1 (continued)

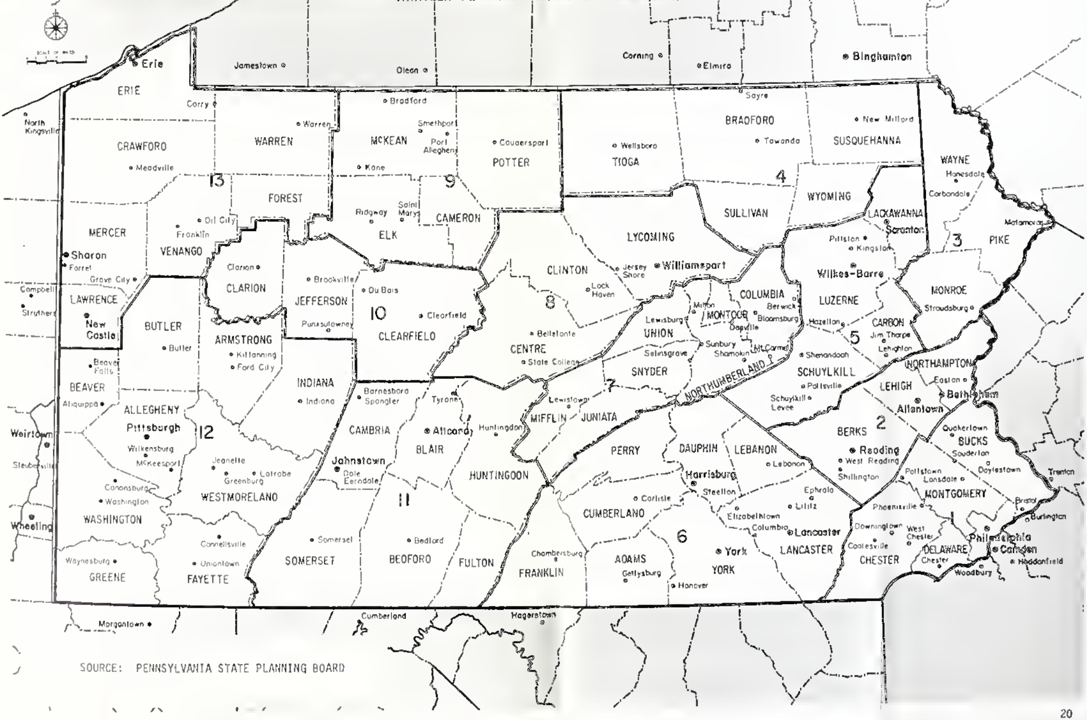
Social Goals

- Upgrade the quality of life in Pennsylvania. Make the State a more pleasant and stimulating place to live.
- Make cities more livable for people.
- Clean up pollution and dispose of wastes in a socially and ecologically acceptable manner, control noise, and beautify the State.

Balance Competing Interests

- Help each mode of transportation find its comparative advantages in Pennsylvania and develop them fully for the benefit of all Pennsylvanians.
- Help balance the economic development among the thirteen geographical planning regions of the State developed by the State Planning Board and shown in Figure 2-1.

FIGURE 2-1
COUNTIES AND MAJOR COMMUNITIES IN THE
THIRTEEN PLANNING REGIONS OF PENNSYLVANIA



SOURCE: PENNSYLVANIA STATE PLANNING BOARD

It will be noted in Table 2-1 that two other goals were added to those mentioned previously. Since PennDOT will be concerned with the statewide impacts of all proposed transportation projects, it must seek a balance among the competing modes and among the geographic areas of the State, and Goals 15 and 16 were added to reflect this need.

The goals for economic and social development of the State given in Table 2-1 can be refined into more specific goals*, such as:

1. Attract to our cities small industry fleeing from the high-cost areas of neighboring states.

2. Help Pennsylvania manufacturers in competing with manufacturers in other states and other countries.

3. Fully utilize opportunities afforded by Federally funded programs for advances in technology, education, transportation, urban renewal, and economic revitalization; provide the locational characteristics desired by industry which responds to the needs and programs of the Federal Government.

4. Capitalize fully on Pennsylvania's proximity to the world's richest markets; facilitate the marketing of Pennsylvania's products and services in "Megalopolis."

5. Encourage the pioneering of new technological developments and growth in the life science, urban engineering, coal and nuclear energy, and the forest products industries.

6. Promote and encourage materials research and production in Pennsylvania.

7. Make Pennsylvania the "Transportation Research and Development State" to insure full participation in growth industries.

8. Keep more young people in the State, particularly those who are dynamic and have potential for making great contribution to industry, services, or the arts.

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* Partially adapted from Dr. Thomas G. Fox and Professor Patrick Conley, "Science and Technology, Opportunities for Economic Growth", First Annual Report of the Governor's Science Advisory Committee, Commonwealth of Pennsylvania, August 1966.

9. Attract to Pennsylvania more of the nation's influential decision-makers from the fields of business, education, and science.

One could argue with the goals and objectives mentioned above, or perhaps add to the list goals and objectives which seem equally worthy of pursuit. However, the lists, as presented, do give direction for the purposes of planning. They provide the first step toward development of the Interim Master Plan for Transportation. The next step is concerned with the identification of alternative projects which will serve the goals enumerated above.

SECTION 3

IDENTIFICATION OF ALTERNATIVE PROJECTS AND PROGRAMS

3-1 Introduction

The second step in the planning process is to generate ideas for alternative transportation improvement programs and projects which could be directed toward meeting goals and objectives. In most instances, this means finding suitable ideas for adding to the existing transportation and socio-economic infrastructure in Pennsylvania and for connecting with developments in contiguous states. Also, it will often be possible for a PennDOT to add support to ongoing plans of existing organizations or favorably alter their plans by initiation of appropriate projects. Even the administrative and regulative aspects of transportation-related improvements can provide the genesis for possible PennDOT programs and projects.

Given the broad scope of a PennDOT, it becomes necessary to conduct a systematic search through several sources for candidate activities to include in a master plan. The sources which will most often give rise to ideas for transportation-related projects and programs worthy of PennDOT consideration are:

(1) Advances in technology
(2) Programs of the Federal Government agencies
(3) Programs and activities of State and local agencies
(4) Transportation-related plans and activities of private enterprise
(5) Extrinsic and intrinsic social, economic and geographic forces
(6) Existing rules and regulations which apply to transportation-related construction, financing, and operations

A preliminary effort was made to generate ideas for PennDOT involvement by exploring the sources listed above. The following discussion gives some highlights of findings which were instrumental in delineating some alternatives for PennDOT undertaking. A summary of the most noteworthy alternatives is at the end of this section (Table 3-1).

3-2 Impact of New Technology on Transportation in Pennsylvania

New technological developments in the field of transportation should be recognized because they often present potential solutions to problems and occasionally present new problems which must be dealt with, *e.g.*, automobiles and automobile exhaust. No plan for overall transportation development can be complete without at least considering new technology on possible projects and programs for a PennDOT in the period to 1975. Details of this study (to circa 1975) are given in Appendix A.

One of the most significant conclusions which resulted from consideration of probable technological advances is that almost all transportation technology which will be in practical use by 1975 has already been conceived. Thus, in some respects, we are not talking about new technology, but application of existing technology with a few modifications. The years between 1968 and 1975 will bring many demonstration projects, designed not only to test engineering and scientific skill in translating theory into practice, but also to test the social acceptability of new vehicles and systems. Such factors as improved air pollution control, muffling excessive noise, increased aesthetics and comfort will, in many instances, prevail over such time-honored engineering goals as capacity increases, cost-saving, and efficiency. Why? Because, almost certainly, as we become more affluent and better educated, we begin to spend more on the so-called luxuries of life. We become more mobile, but we want quality in transport as well as mileage, and we will be able to pay for it. New developments in passenger transportation will be directed toward satisfying demands which are building up now. The U.S. Department of Transportation (U.S. DOT) is trying to provide a mechanism, through appropriate funding, whereby technological improvements can be realized. One example of the new approach to technological development is the U.S. DOT's role in experimenting with high-speed rail transportation on the Northeast Corridor. The United Aircraft Train and Penn Central Train, each capable of speeds exceeding 150 mph, will be placed in service in 1968, though at speeds much below their potential top speed of 150 mph. Much work will have to be done to the rails by 1975 in order to significantly reduce the time-in-transit between

Washington, D.C., and New York via Philadelphia (The initial high-speed trains will reduce existing travel time of 3 hrs. and 55 min. between Washington and New York by about 30 minutes). These requirements will give rise to efforts to find some better support and guidance mechanism than the rails. For all practical purposes, the rails are speed-limited at about 150 mph, even though test runs have been made on rails at over 200 mph in France and in the U.S. (See Appendix A). The problem with rails is that they must be very smooth and even in order to accommodate heavy high-speed vehicles. However, the inherent plasticity of rail beds and the excessive damage to the rails brought about by high speeds will lead to very high maintenance costs and searches for economical ways to operate air cushion vehicles over modified rail beds. The French could be the first to operate such a vehicle (an Aerotrain) if they can solve the noise problem. Their Aerotrain should be operating on short runs, perhaps to Orly International Airport and the South from downtown Paris, in the early 1970's.

By 1975, the Northeast Corridor trains will still be running on rails. The speed and time in transit will probably be a function of the public demand for train service as opposed to air service on the Northeast Corridor. If demand should appear to be insignificant, very little will be done to improve the rails. To take maximum advantage of higher speeds, much work will be required to improve the Northeast Corridor rails, particularly in the Philadelphia Area, where there are five especially troublesome and severe curves, and to the south from Newport, Delaware, to Washington, where there are 22 grade crossings.

Other breakthroughs by 1975 related to rail transportation will include perfection of the linear induction motor (which operates in conjunction with propulsion components in the bed or track over which the vehicle moves) and command and control systems for automatic routing. At high speeds, it becomes more important to have automatic braking and acceleration devices for purposes of safety. Sections of the Berlin Subway are already operating under automatic control. The new trains to operate between Linderwold, New Jersey, and Philadelphia starting in 1968, will have automatic controls. The Japanese Tokaido Line will be fully automated soon. In addition, the Japanese provide for safety by constructing pushbutton circuit breakers at strategic points on the Tokaido Line where passers-by can easily stop the trains should they see a potentially hazardous situation.

Even with stimulation from the U. S. DOT, however, there will probably be continuing overall decreases of ridership on the U. S. rails through 1975, except for commuter service and intercity service within certain agglomerate population complexes. Nevertheless, certain new types of rail systems will develop to serve specialized uses. Although monorails have been in existence for a number of years now, they have not really made a great contribution to solving urban transportation problems because of inherent switching difficulties and requirements for expensive and massive supporting structures. Monorails will find their niche however, in providing short-haul urban transportation, such as from downtown areas to airports. (An airport monorail is now being planned for Los Angeles.)

Other transportation devices and systems being proposed to solve the urban commuter problems include the Skybus and a spate of compact wheeled vehicles which would run on guideways between downtown and suburban areas. Most of the technology required for wheeled vehicles on guideways is already available, including automatic spacing, switching, etc. One problem which all of the compact-vehicle or guideway systems share is lack of parking space at points of great interchange. Even so, there is a strong possibility that at least one demonstration project will be underway in a U.S. city by 1975 to test some form of compact electric car on a guideway. (Some electric cars *will be* in use on city streets by 1975.) Of course, the Skybus has already proved to be an engineering success at the South Park Test Site in Pittsburgh. It has yet to be proven a commercial success, however. A reasonable suggestion for modification of the Skybus has been to make provisions to roll the buses off the guideways and onto suburban streets to collect commuters during the morning and evening hours. Conceptually a driver would mount the bus as it came off the guideway, drive in a loop through suburban neighborhoods, and return it to the guideway where it would be engaged for the downtown trip as an automatic vehicle. The driver could then pick up another bus and make another loop. This might be an answer for providing better public transportation service in areas where population density is light, but the number of commuter residents is significant. The "rail-bus" being tested by the Red

Arrow Line in Philadelphia, is noteworthy because it is competing in concept for the same market as that which would be served by a Skybus. It is essentially a standard bus which has the capability of operating on existing railroad tracks and on city streets. It will soon be demonstrated in regular service between Media and downtown Philadelphia. Initial reports are that its suspension on rails may cause some discomfort.

Another proposed answer to the same problems addressed by the technology of the guideways amounts to an extra lane of pavement on existing roads and luxurious buses running in this exclusive lane, one-way into the city in the morning and one-way out in the afternoon. Presumably, the extra lanes would go down the center medianstrip of four-lane highways or on the edges of a highway right-of-ways and add proportionately little to the cost of land acquisition plus construction. Such an exclusive bus lane is reportedly being planned as a part of the expressway construction in the Minneapolis-St. Paul urban complex.

Many grand systems will be considered and evaluated, in the period to 1975, for mass commuter transportation in the Commonwealth. However, the acquisition costs of right-of-way on the ground could present major blocks to the completion of urban transportation improvements especially in Pittsburgh or Philadelphia. This suggests that an open-minded study of existing radial right-of-way in Pittsburgh and Philadelphia might be worthwhile. For example, there appear to be many railroad tracks in both Pittsburgh and Philadelphia which are seldom used for freight movement. Perhaps the nearly abandoned right-of-ways could have been used to provide a route for passengers rather than freight. The rivers in Pittsburgh and Philadelphia might also provide rights-of-way for Air Cushion Vehicles to carry some commuters. Air Cushion Vehicles (ACV's) are already used successfully on some waterways in Europe and Russia and there will soon be ACV's in operation across the channel between England and France. Unless existing guidance problems are solved they may not be suitable for use on curved, rocky and heavily traveled rivers.

Other urban transportation problems are encountered in moving peripherally around cities and in moving in crowded downtown areas. The private automobile will probably provide the best solution to peripheral movement for many years past 1975. More concentric highways will be needed around such cities as Pittsburgh, Philadelphia, and Harrisburg in the years to 1990.

In crowded downtown areas, even in 1975, the best means for maneuvering over short distances will be on foot. Nevertheless, considerable effort will likely go into research for improvement of pedestrian movement, *e.g.*, moving belts, chairs on belts, etc. Efforts will be directed toward development of automatic on-call transportation devices, but there is no foreseeable near-term substitute for walking or riding in manually-operated public and private vehicles. Some form of electrically driven chair which can climb curbs and steps may be developed by 1975. The motor driven chair would principally be used by the handicapped and the elderly. Conveyor belts will gain acceptance where pedestrian traffic volume is particularly high and linear in direction, but will not provide an answer to the multidirectional transportation needs of most pedestrians.

Surprisingly, there may be a return to an old concept for passenger movements beyond comfortable walking distance in downtown areas——the "jitney." The modern day version is called a "minibus," but its function is the same as the old jitney operated by entrepreneurs in many downtown areas in the 1930's. Fourteen minibuses are now providing short-trip transportation in downtown Washington, D. C. The fare is 5¢ ("Jitney" was once a slang word meaning 5¢). Minibuses provide seats for 18 people and standing room for 12 people. Headway in Washington, D. C., is about 2 minutes. If any new technology is to be applied to the minibus system, it should be in signaling and fare collection. Making change is time-consuming and, to some extent, defeats the purpose of the vehicle. Jean Gottman (author of the book *Megalopolis*) has suggested elimination of fares altogether on public transportation in downtown areas. The argument is that public transportation downtown should be provided free for everyone just as police services and fire protection are provided without direct charge. In fact, Prof. Ezra Krendel of The University of Pennsylvania has suggested placing special policemen in jitneys to provide safe door-to-door transportation as well as a benign municipal presence. Ideally, such an arrangement would lead to better enforcement of law and order in ghetto areas while at the same time improving the mobility of ghetto residents.

As has been pointed out, the urban transportation difficulties cannot be completely divorced from intercity travel. For example, monorail or train-type vehicles, going to and from airports, represent technological developments in intercity transportation systems. However, when city pairs are closer than about 250 miles (such as Pittsburgh and Philadelphia), it may be cost-effective to fly from city center to city center using short take-off-and-landing (STOL) aircraft or helicopters. Of course, helicopter service to airports is already provided in San Francisco and New York but flying distances are short, *i.e.*, less than 35 miles (New York helicopter service from the Pan American Building was dropped in 1968 because of high operating costs but continues from the downtown area). No regularly-scheduled intercity helicopter service is provided between cities in the United States at the present. Nevertheless, there is a strong possibility that helicopters or STOL aircraft capable of economical intercity travel will be available by 1975. Such vehicles are already under design and in the testing stage. The only deterrent to their introduction by 1975 would be a continuation of the war in Vietnam, which would constitute a drain on the manpower and production facilities of the manufacturers. An end to the war will spur helicopter and STOL aircraft manufacturers to seek non-military markets aggressively. The intercity helicopter which the manufacturers will promote for commercial use, will be large, durable, and comfortable, *i.e.*, vibration-free but will present some noise problems. It will seat about 100 passengers or more and have a cruising speed of over 180 knots (more than 200 mph). Its range will be over 200 miles. It will, however, be an expensive ride, costing the passengers well in excess of 10¢ per seat mile. For this reason, the helicopter will not be the practical answer to moving large numbers of people daily between Pennsylvania's cities and those in neighboring states. The large helicopters will, however, provide useful supplements to other transportation systems, particularly for busy businessmen. This suggests that heliports should be located near where business executives work and live, but heliports need not be particularly numerous in any one metropolitan area. STOL aircraft, on the other hand, will be comparatively small vehicles carrying about 5-10 passengers which can take off and land within 300 feet. The ride will be more economical than a helicopter ride but the landing field components will be much more costly.

Other intercity passenger vehicles, such as buses and autos will likely be much the same in 1975 as they are now. Fixed wing aircraft will be larger and faster. The Boeing 747 "Jumbo Jet" will be large enough to accomodate about 500 people. However, it will start flying in late 1969 with seating capacity for only about 300 people. Some changes in CAB rules which will favor lower fares may encourage more airlines to add seats, however. Both Pittsburgh and Philadelphia airports are making plans to accomodate the great surge of passengers when Jumbo Jets arrive. Lack of airplane parking space and slow baggage handling will be major problem areas. One proposed answer to the baggage problem would be a delivery system whereby baggage is suspended on jets of air. The airport runways at Pittsburgh, Philadelphia, and Harrisburg are now sufficiently long to accomodate the Jumbo Jets. Some possible reinforcing may be required at the end of the runways, but it will not be a major undertaking.

The Boeing-built SST will not be available for commercial use until the late 1970's at the earliest. The SST program has suffered several extensive set-backs because of technical difficulties. The Anglo-French built version of an SST, the Concorde, will be flying before 1970 as a prototype. Nevertheless, even the Concorde will not be a familiar sight at the two largest Pennsylvania airports until about 1975 or later, unless the French and the British move more rapidly to expand production capabilities.

At any rate, any airport which can accomodate a Jumbo Jet can also accomodate an SST. Thus, no special arrangements need be made immediately in anticipation of its arrival except, possibly, in regard to the interference with air freight schedules. The SST's will have unusual departure and arrival times because of their exceptionally fast speeds and long-range of flight to countries which are 16 hours or so out of phase with us. Late night passenger flights may conflict with the busy period for flying freight, but this does not constitute a major problem.

The air freight volume, already moving ahead vigorously, should take a quantum leap forward when the Jumbo Jets are in full service for freight movements in the early 1970's. Some experts are predicting that current air freight costs per ton-mile will be cut in half by the efficiencies to be recognized in using Jumbo Jets. Whether the air freight rates can be cut by as much as one half is speculative in view of expected airport-to-shipper distribution problems. Nevertheless, the impact of the arrival of the Jumbo Jets will probably be felt by trucking and railroad companies.

Greater competition for more of the high-profit freight will probably provide incentive for trucking companies and railroads to join forces and exploit their comparative advantages. The "economic glue" which will bind trucks to rail cars will be container handling for container-on-flat-car (COFC) service and improvements in piggyback operations (TOFC). With the railroads providing the fast, non-stop long-haul, and with trucking companies making fast local deliveries, the combination may yet stave off attempts of the airlines to take virtually all of the long-haul, high-value, lucrative freight movements.

The container which facilitates efficient intermodal handling of freight is little more than a sturdy, light-weight box with dimensions of 8'x8'x 10' to 40'. The container itself does not constitute the end product of revolutionary technological breakthroughs. Even container handling equipment need not be particularly complex to accomplish great advantages over "manual" handling of freight. Yet, the almost revolutionary switch to containerization is having all of the impact on the freight transportation industry of a major technological breakthrough.

Containerization is affecting all modes of transportation, except the pipeline mode. The trend toward containerization will have the effect of diminishing the volume of long-haul trucking (greater than 300 miles) and shifting the long-haul movements to container-carrying Jumbo Jets (for very high-value freight) and to railroads (for some freight which would otherwise go by truck). There has already been a dramatic increase in the use of containers for international freight by steamship companies. Whether the container goes by rail, air, or water, the first and last legs of the trip will be short-hauls by trucks to and from shippers.

The existing competitive interfaces between four modes will be spanned by containerization (Figure 3-1). Currently, the selection of mode used for transporting freight is chiefly a function of the costs to the shipper and the required transport time. Shipping costs, in turn, are a function of the unit values of the products to be shipped ($/ton), the distances shipped (miles) and the quantities shipped point-to-point (tons/year). For example, products of high unit values, shipped in small lots over great distances, can advantageously travel by air. When the same products are sent over short distances, i.e., less than 500 miles, the lower freight rates of LTL (Less Than Truck Load) prevail. Thus, there are competitive break-points at which high-value products travel by truck or air depending on trade-offs between the value of time in transit to the shipper and the cost of the movement to the shipper as shown conceptually with other interfaces in Figure 3-1. The effect of containerization will be to break down the competitive interfaces at points where distances are greater than 300 miles and where bulk shipments are not practical. The cost of the long haul will become the controlling factor.

Containers will expand the function now provided on a more limited basis by "piggyback" movements. The advent of containers is being restrained now only by resistance to a reordering of roles to be played by each mode, standardization of container size, and more efficient equipment for transferring containers between trucks and other freight carrying vehicles.

The U.S. Department of Transportation is currently showing interest in improving intermodal transfer of containers, break-bulk handling, and stuffing operations, i.e., assembling small lot quantities in containers. The U.S. DOT is considering the Philadelphia area for a demonstration project related to techniques for operating a bi-modal or tri-modal distribution center.

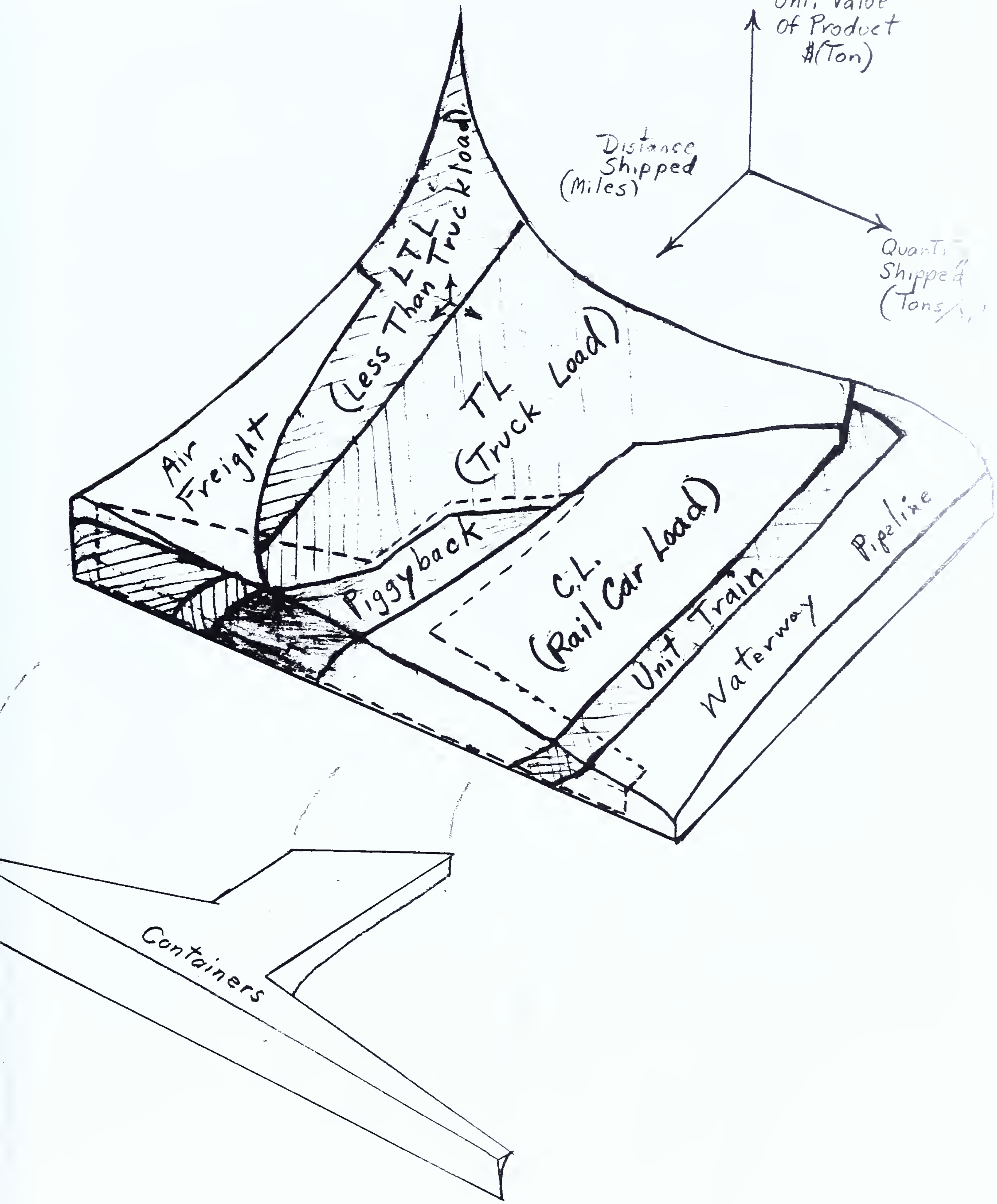


Figure 3-1. Competitive Interfaces Between Modes for Freight Terminals

3-3 Relevant Plans and Programs of Federal Government Agencies

It is important that PennDOT consider the various transportation-related programs of Federal Government agencies in formulating its plans, programs and budgets. While shift in Federal funding sometimes make it difficult to carry out State programs financed in part by Federal agencies, the magnitude of Federal matching funds is a necessary supplement to the resources available to the State. Unfortunately, the continuing escalation in the Vietnam conflict has resulted in a substantial drain on Federal funds for transportation projects. According to U. S. DOT spokesmen, the threat of rapid inflation, which often accompanies military spending, would be increased substantially if additional Federal dollars were concurrently being spent on transportation improvements. All indications point toward continuation of Federal financing of transportation projects which had already been approved once the current threat of uncontrolled inflation is relieved. Additionally, massive doses of Federal funds will probably be channeled into transportation development after the Vietnam conflict is settled.

In many cases, only local governments are eligible to receive Federal financing. Nevertheless, PennDOT administrators should be aware of such programs and help local governments to receive Federal financing for transportation improvements whenever possible. In these instances PennDOT assistance may be in form of planning and or co-financing with the appropriate Federal agency.

Federal transportation programs are now chiefly administered by the new U. S. Department of Transportation. However, many transportation-related programs are administered by several other Federal departments and administrations. Summaries of appropriate Federal programs is included in Appendix B in which the programs are grouped and presented under the heading of the agency which sponsors them. A cross-reference (Table B-1) for Federal programs precedes the summaries given in Appendix B. The cross-reference applies to undertakings which a PennDOT may support or actively manage and which may receive financing from a Federal agency.

The types of transportation-related programs which are sponsored by Federal agencies can be classified roughly in about five categories, described below: highway planning and construction, mass transportation improvement, airport development, aid for water transportation, and site acquisition and development, described below.

Highway

The Federal Highway Administration of the U. S. DOT makes grants to states for construction and improvement of highways under its *Highway Planning and Construction* program. Grants are for 90 percent of the costs of the 41,000 mile National System of Interstate and Defense Highways and 50 percent of the costs of Federal aid primary and secondary highways. Assistance includes funds specifically for planning and research. Research may include studies of increasing the contribution of highways to national, state, and local urban and rural needs.

The *Highway Beautification* program of the Federal Highway Administration provides Federal financial assistance to state highway departments or state departments of transportation for: beautifying highways and communities by controlling outdoor advertising signs, billboards, and displays; controlling the establishment, use, and maintenance of junkyards adjacent to the highways; and landscaping and otherwise enchancing the scenery along Federal-aid highways. The Federal share of the costs is usually 75 percent.

The National Highway Safety Bureau of the U. S. DOT administers a *Highway Safety* program which includes a matching-grant program to states and extensive research and development activities. The Bureau's research program provides funds to investigate such areas as driver education and licensing, vehicle inspection, and traffic control procedures. These funds may also be used for (1) training programs for highway safety personnel, (2) research fellowships in highway safety, (3) development of improved accident investigation procedures, (4) emergency service plans, and (5) demonstration projects.

Mass Transportation

The Urban Transportation Administration of the Department of Housing and Urban Development (HUD) administers activities to develop and improve urban mass transportation. However, plans have been made to transfer many of the transportation functions of HUD to U. S. DOT. Nevertheless, there will be a continuation of the Urban Mass Transportation programs under U. S. DOT administration. The *Urban Mass Transportation Grant-and-Loan* program provides Federal financial assistance to public agencies for capital improvements to mass transportation systems. Grants are made for up to two-thirds of the cost of improvements that cannot reasonably be financed from revenues. Long-term loans, which may not be used to augment capital grants, are made where the total cost of improvements can be financed from revenues. Private transportation companies may participate in assisted projects through contractual arrangements with a public agency. Grants and loans are available to state, interstate, regional, or local public bodies for the acquisition, construction, reconstruction, or improvement of facilities and equipment for use in mass transportation systems in urban areas. Repairs, maintenance, or other operating costs are not eligible for this assistance.

The *Urban Mass Transportation Demonstration Grant* program provides Federal financial assistance for testing and demonstrating new ideas and new methods for improving mass transportation systems and services. This assistance is furnished through grants of up to two-thirds of the cost of approved demonstration projects.

Under the Department of Housing and Urban Development's *Model Cities* program, communities have been receiving assistance for developing better means of transportation for those working and living in blighted areas. Such programs should continue to contribute to the ease of access between residential areas and centers of employment.

Air

The *Airport Development* program of the Federal Aviation Administration, U. S. DOT provides technical and financial financial assistance to public agencies for planning, acquiring, and developing public airports and heliports that will extend the nationwide air transportation system. Property interests in Federal lands, as well as Federal grants, are available for projects essential to the operation and safety of airports. Grants can be made for (1) land acquisition; (2) site preparation; (3) construction, alteration, and repair of runways, taxiways, aprons, and roads within airport boundaries; and (4) construction and installation of lighting and utilities and certain other off-site work. The Federal Aviation Administration generally provides 50 percent of the costs.

The Federal Aviation Administration also provides guidance for planning public airports, taking into consideration community needs, growth potential, and expansion possibilities (See Table B-2 in Appendix B for the Pennsylvania Airport Plan). Technical assistance and advice is provided on airport paving, lighting, drainage, fencing, safety, noise abatement, airspace geometry, snow removal, and accident prevention.

The Environmental Science Services Administration, Department of Commerce, can provide advice and technical assistance in planning for and installing weather instruments and facilities, including their specifications, and in recording and interpreting weather information. The Department of Defense can also provide technical information on design and construction of weather instruments and facilities.

Several other departments and agencies provide assistance for air transportation development:

1. The General Services Administration may convey surplus real property for public airports.
2. The Department of Interior may lease public lands for airports.
3. The Small Business Administration makes loans for aircraft hangars and related buildings to applicants in the aircraft business.

4. The Department of Justice provides advice and technical assistance for constructing inspection facilities at airports used as immigrant entrance points.
5. The Department of Agriculture provides planning assistance for airport development, particularly for foliage control, wind-breaks, and drainage.
6. The Appalachian Region Commission finances certain airport construction in Appalachian counties (See Table B-3).

Water

The Maritime Administration, Department of Commerce, promotes the *Development of Ports* and associated transportation facilities to achieve optimum utilization of harbor areas for waterborne commerce and to encourage the economic growth of the port community and the territory tributary to the port. The Maritime Administration advises communties on matters pertaining to port administration and operation and on port development, including the appropriate location and plan of construction of wharves, piers, and water terminals; investigates the praticability and advantages of harbor, river, and port improvement; determines the causes and possible remedies of congestion at ports; and studies territorial regions and zones tributary to ports, taking into consideration the economics of transportation by rail, water, and highway, and of the natural direction of the flow of commerce.

Construction of projects and facilities related to water transportation are supported through programs administered by the Departments of Defense (Army Corps of Engineers), Interior, Commerce, and Transportation and by the Tennessee Valley Authority. Most Federal expenditures are made through direct construction programs. Local officials who believe that water transportation facilities may be needed as integral parts of comprehensive urban transportation and development projects should consult the Departments of Housing and Urban Development and Transportation.

The Coast Guard, U. S. DOT, offers a wide range of *Marine, Harbor, and Waterfront Services* to local government officials, law enforcement agencies, the merchant marine, and private citizens. The Coast Guard provides aids to navigation, inspects merchant ships for safety and seaworthiness, inspects small ships for safety, provides air and marine craft for rescue operations, enforces the Oil Pollution Act, provides literature and films for public information, and protects and enforces security of harbors and waterfronts.

Site Acquisition and Development

The acquisition of rights-of-way and other land needed for major transportation facilities is usually included in the cost which the Federal Government will share. However, State and local officials must obtain specific guidance on this point from the appropriate Federal agencies as a part of their initial planning. PennDOT officials can also explore with the General Services Administration (GSA) and with other Federal agencies which control real estate, alternatives to purchasing sites. GSA may be able to make land, structures, materials, and contruction equipment available through the *Surplus Real Property* and *Surplus Personal Property* programs. Surplus property can be transferred at a wide range of costs depending on the benefits to the public that will result, as demonstrated by the State or local agency. GSA may also be able to arrange for easements and other uses of federal real property. That office can also guide PennDOT officials to other Federal agencies which may provide easements, transfer real property, or provide other assistance. The Departments of Defense, Agriculture, and Interior are the major sources of such aid. These Departments should also be consulted concerning community use of facilities constructed by them, particularly roads on large Federal reservations.

Local governments sometimes may contribute land, rights-of-way, closed streets, and other real property toward their share of Federally aided projects under several cooperative programs in other fields as well as in transportation. The possibilities of arranging for such contributions should be discussed with Federal agencies and associated State agencies as a part of the early stages of planning.

3-4 Other Notable Activities of Federal Agencies

While the most discussed Federal programs are those for funding projects, there are other Federal programs which are worthy of mention. One such program is the *Foreign Trade Zones* program which is administered by the Foreign Trade Zones Board of the Department of Commerce. Essentially the program is one of establishing restricted zones at strategic locations in the United States where private business can store or upgrade imported items without paying customs duties. Other fringe advantages to a user of a foreign trade zone are that quotas are not appilicable and Federal security officers would be on duty in the zone at all times. The presence of security officers would prevent thefts and possibly lower insurance rates.

The only time a user of a foreign trade zone pays a duty is when he removes material from the zone to ship it to some location in the United States. However, regulations do permit shipping from one trade zone to another or to a "subzone" without paying duty. Even those who plan to resell items in the United States from stock held in Foreign Trade Zones sometimes find advantages in not paying the duty until the time of sale. Needless-to-say, Foreign Trade Zones and their subzones can become neuclei for vigorous economic activity.

The potential for deriving regional economic benefits from a Foreign Trade Zone with subzones in Pennsylvania has given rise to possible projects for PennDOT. For example, PennDOT might cooperate with the State and Federal Departments of Commerce in establishing trade zones at Philadelphia, Pittsburgh, Erie, Harrisburg and any other strategic location in the state, such as an economically distresses community in Appalachia. A PennDOT's role conceptually would be in bonding shipments between interior zones and points of entry or exit.

Currently Foreign Trade Zones are located in New York City, New Orleans, San Francisco, Seattle, Toledo, Honolulu, and Puerto Rico and in various other countries. The most recent petition for a new Foreign Trade Zone came from New Jersey in May 1968. The location of the proposed Foreign Trade Zone was Bayonne. At New Orleans, where a Foreign Trade Zone has been operational for a number of years, the Port Commission applied for a subzone in March 1968. Thus, indications are that Foreign Trade Zones are desirable and present substantial benefits to states where they are located.

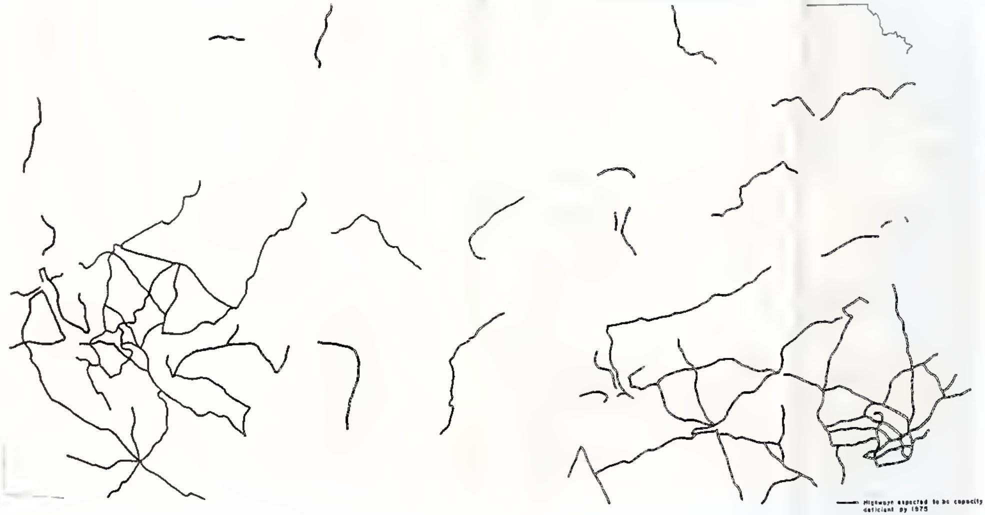
3-5 Programs and Activities of State and Local Agencies

It is important to recognize and understand the programs and activities of agencies with which PennDOT might have an interface. In some instances public agencies have already committed themselves to courses of action which PennDOT could not easily alter, but which will greatly influence PennDOT's master planning. PennDOT will often have to carry out its programs by providing appropriate funding to other agencies or by providing studies which will give direction to other agencies. Furthermore, conflicts may arise unless there is a thorough understanding of all the plans and directions of the many agencies engaged in transportation-related activities at all levels of government. The most significant transportation related programs and activities of State and local agencies are described in Appendix C.

The State agency which is most active in improving transportation in Pennsylvania is, of course, the Department of Highways. This Department has budgeted expenditures of more than $900 million for the fiscal year 1968-1969 including federal matching funds. About $600 million of the amount is to be used in new construction. The remaining $300 million is used for maintenance, disbursements to the State Police, etc.

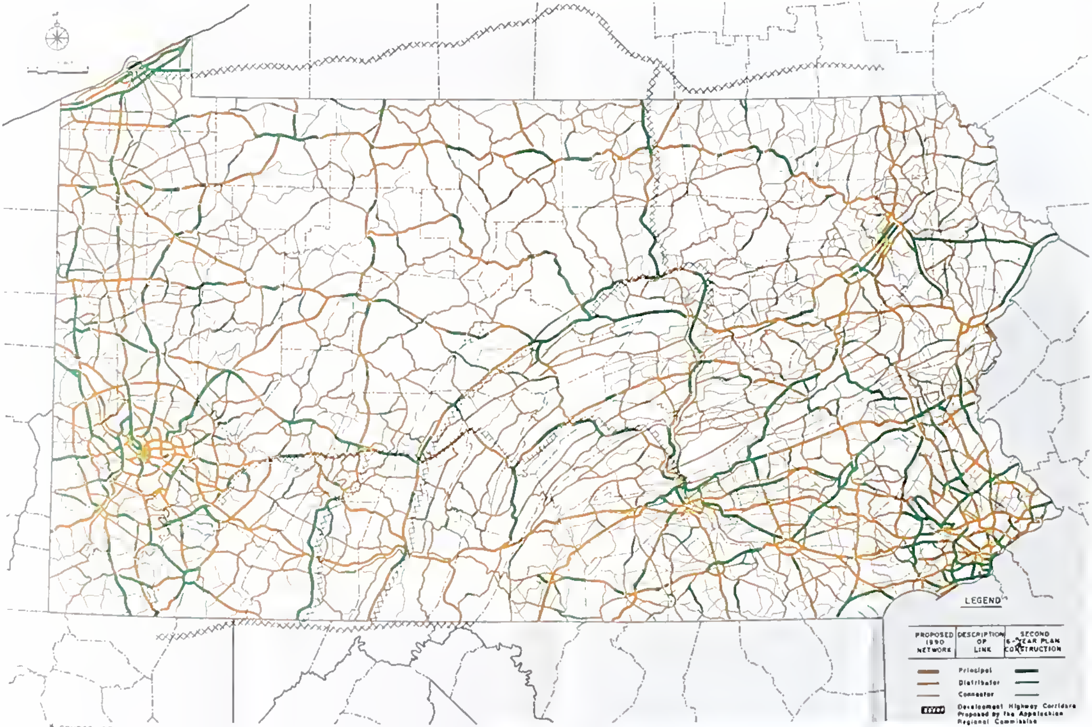
For the most part, the money spent for new construction goes into relocating existing highways and building interstate highways. These are steps toward building the "ultimate" highways network. By definition, the ultimate network is shown in Figure 3-2b. Also shown in Figure 3-2b are the links which are to be constructed or improved by mid-1973 according to the most recent short-range developement program. The short-range program, known as the "Second Six-Year Highway Improvement Program", calls for spending $3.2 billion between 1967 and 1973. The overlay, Figure 3-2a, shows the links which will probably be capacity deficient by 1975 if no action is taken to make improvements (see Demand Analysis, TAC Project 5, for details). The indication is that most of the links analyzed as likely to be capacity deficient will receive some work by 1973. The total cost of projects included in the Second Six-Year Program and which are directed toward improving identified capacity-deficient links, amounts to about $1.5 billion. Most of the links identified as deficient are in the Pittsburgh and Philadelphia areas where right-of-way and construction costs are

FIGURE 3-2a
CAPACITY DEFICIENCIES INDICATED BY
1975 DEMAND PROJECTIONS



SOURCE: ADAPTED FROM TAC PROJECT 5

FIGURE 3-2b
PLANNED IMPROVEMENTS LEADING TO A
PROPOSED 1990 HIGHWAY NETWORK*


LEGEND
PROPOSED 1990 NETWORK
DESCRIPTION OF LINK
SECOND 6-YEAR PLAN CONSTRUCTION
Principal
Distributor
Connector
Development Highway Corridors Proposed by the Appalachian Regional Commission

* SOURCE PENNSYLVANIA DEPARTMENT OF HIGHWAYS BUREAU OF ADVANCE PLANNING

extraordinarily high. Details of these links are provided in Tables C-1a and C-1b of Appendix C.

The Second Six-Year Highway Program contains significant amounts of relocation work on the Appalachian Development Highway Corridors (Figure 3-2b). These Corridors, designated by the Appalachian Regional Commission (ARC), deserve special consideration because specified improvements on them rate 70% financing from Federal sources. This compares with 50% financing for most non-interstate highway improvements approved by the Bureau of Public Roads (BPR) and 90% financing for interstate highway construction.

Certain ARC sponsored projects in neighboring New York and Maryland have almost as much significance for PennDOT as the work sponsored in Pennsylvania. New York Route 17, and U.S. 40 in Maryland are scheduled by the ARC for substantial improvement and relocation. Both routes roughly parallel the east-west borders of Pennsylvania in close proximity to the State. Thus, there is an opportunity for Pennsylvania to connect some of its remote rural areas to major new arteries and provide for some rural Pennsylvanians the benefits of timewise proximity to such urban centers as Cumberland and Hagerstown in Maryland and Elmira and Binghamton in New York.

Urban mass transit programs in Pennsylvania are carried on chiefly at Pittsburgh and Philadelphia by the Port Authority of Allegheny County (PATS) and the Southeastern Pennsylvania Transportation Authority (SEPTA), respectively. Both organizations have received funding in the amount of 1/6 of construction and re-equipment costs by the Bureau of Community Development, Department of Community Affairs. The funding to date of PATS and SEPTA is shown with other financing by the Bureau in Table C-3 of Appendix C. The proposed mass transit programs of Philadelphia and Pittsburgh are shown with cost estimates in Tables C-4 and C-6, respectively.

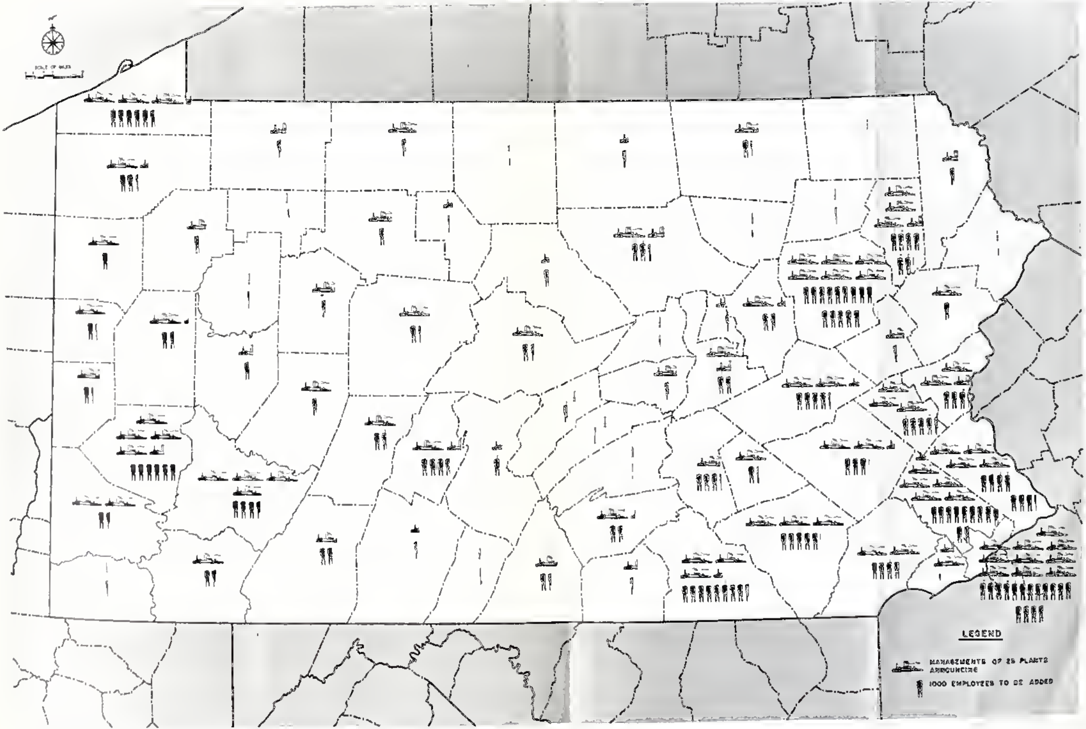
Additional programs of State and local agencies of interest to Penn DOT are discussed in Appendix C.

3-6 Transportation-Related Plans and Activities of Private Companies

Certain plans and activities of private companies have significance for PennDOT. Plans to build or expand industrial plants can create transportation requirements for local areas. For example, industrial activity is often preceded or succeeded by the recognized need for improvement of transportation facilities to move workers and freight.

When many company managements decide to build or expand plants in any one area, new strains develop on the existing transportation infrastructure. One indication of the extent of industrial activity in the various regions of the State is found in the announcements by company managements which are registered with Pennsylvania Department of Commerce. The announcements of intended increases in plant space and employment were accumulated for the years 1964, 1965 and 1966 to get some indication of where transportation-improvement support might be needed. Figure 3-3 shows the number of managements in each county announcing expansions or construction of new plants with estimates of associated employment increases for the 1964-1966 period. The analysis shows that industrial activity is concentrated chiefly in Regions 1, 2, 5, 6, 12, and 13 as would be expected on the basis of population distribution in the State (See Figure 2-1 for boundaries of regions). However, York, Luzerne, and Monroe counties showed surprisingly large numbers of announcements. This could be partially the result of new highway construction which has already made communities in those three counties more attractive for industrial location. New Interstate 83, the Susquehanna Expressway, runs from Baltimore through York County to Harrisburg. Sections of new Interstate 80, the Keystone Shortway, run through Monroe and Luzerne Counties. This would indicate that those three counties might have particularly large needs for additional transportation improvements to local streets and roads. It should be pointed out, however, that this analysis is only a first indication of probability of need for support. The analysis does not include other important factors, such as the number of managements which reduced industrial activity and terminated employees, nor does it contain information on how many managements actually carried through their plans for new activity in an area. Nevertheless, the announcements, with proper interpretation, represent the best generalized

FIGURE 3-3
ANNOUNCED PLANS FOR PLANT ADDITIONS AND CORRESPONDING NEW EMPLOYMENT DURING THE PERIOD 1964-66


LEGEND
MANAGEMENTS OF 25 PLANTS ANNOUNCING
1000 EMPLOYEES TO BE ADDED

NOTE SEE TABLE D-3 FOR DETAILS ON THE NATURE OF ANNOUNCEMENTS

indications of needs by manufacturing companies for transportation support during the next few years. Some interpretation of the management annoucements and regional analyses of historical industrial developments are given in Appendix D.

While the emphasis in Pennsylvania seems to be on increasing manufacturing employment, it should be noted that non-manufacturing employment is playing an increasingly larger role in the economy of the United States, and will likely continue to do so in the future*. The non-manufacturing employment tends to cluster in or near core cities. In Pittsburgh, for example, non-manufacturing employment increased 18% between 1950 and 1966, while manufacturing employment declined 13%. This would indicate that improvements in mass transportation will be needed to accomodate the increasing numbers of people who work in service jobs in Pennsylvania's core cities, but live in suburbs. Additionally, the improvements in mass transportation plus other improvements required to make Pennsylvania's cities more "livable" should have the effect of drawing more desirable high-paying service jobs into the State.

Certain private companies are directly involved in improvements to passenger transportation and freight transportation in Pennsylvania. It follows that their plans and activities are of particular interest to a PennDOT because of an inherent need for cooperation to serve the public interest. There are many companies in the State which are in the business ov moving people and freight. Of these companies, the Penn Central Transportation Company stands out as being especially significant because of its extensive operations in Pennsylvania and its influence on transportation planning by a PennDOT. Some indications of the Penn Central's importance in the State are:

(1) It has the only east-west rail service across Pennsylvania.
(2) It owns sizable amounts of real estate in downtown Pittsburgh.
(3) It and the Reading Railroad provide much of the commuter service in Philadelphia.

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*Clopper Almon, *The American Economy to 1975*, Harper and Row, 1966.

Some of the most relevant plans of the Penn Central are found in Appendix D. One interesting aspect of the Penn Central's plans is to run longer and fewer trains across the State. This results in operating efficiencies, but reduces service slightly unless compensating improvements are made in switching and terminal operations.

An analysis of freight car movements east-west across Pennsylvania on the Penn Central tracks showed a surprisingly high percentage of TOFC/COFC (Trailer on Flat Car/Container on Flat Car) movements. For the month of November, 1967, about one-fifth of all rail cars which traversed the State were TOFC/COFC (See Table D-4, Appendix D).

The information on trans-Pennsylvania rail car movements was combined with information on truck movements on the Pennsylvania Turnpike to get some estimate on potential utilization of a proposed new high-speed rail line across the State (one possibility for use of a Keystone Corridor-see Appendix H-4 for details). The conclusion was that improvements of switching and terminal operations should precede actual construction of a straight high-speed rail line across Pennsylvania to supplement the existing circuituous Penn Central tracks and the Pennsylvania Turnpike for freight movements. Furthermore, the preliminary evaluation of potential Corridor usage indicates that a large volume of passenger movement will be needed to justify construction of a Keystone Corridor. However, it is possible that a large volume of passenger traffic could be generated for high-speed ground transportation (perhaps on air cushion vehicles) across the State by the end of this century.

3-7 Extrinsic and Intrinsic Social, Economic, and Geographic Forces

There are certain social, economic and geographic forces which will have an effect on the needs and opportunities for transportation improvement in Pennsylvania. These forces should be recognized and related to opportunities for PennDOT action.

One of the most striking observations about Pennsylvania is its strategic location as a link between major population clusters (Figure 1-2). The Pittsburgh Area is on the western-most tip of a string of high population density communities which originates in the Chicago Area ("Chi-Pitts"). Erie is at the southernmost tip of the "Great Lakes Industrial Belt." Philadelphia is toward the middle of the "East Coast Megalopolis." These strings of population clusters resulted chiefly from transportation networks which developed early in the history of the United States. In turn, transportation networks were largely influenced by topography and waterways which were the major historic determinants in locating transportation facilities. Thus, Pennsylvania's rugged central regions, having no navigable waterways, have largely been by-passed with reference to population settlement and rearrangement of the landscape (except for coal mining activities). Even the principal routes which traverse the State today, the Pennsylvania Turnpike, and the Main Line of the Penn Central, curve along river beds and follow paths of least resistance in linking Chi-Pitts with Megalopolis. The relatively straight route of the soon-to-be completed Interstate 80 is a latter-day tribute to man's conquest over nature. Even with present technology, however, it is still particularly difficult to build east-west and northwest to southeast transportation links across the State because of the topographic barriers.

The transportation network which currently serves rural Pennsylvania was designed to bring coal and agricultural products to their principal markets in urban areas. Figure 3-4 illustrates the locations of principal farming areas in the State. The farm lands of southern and eastern Pennsylvania have been the principal sources of food for the residents of all Megalopolis.*

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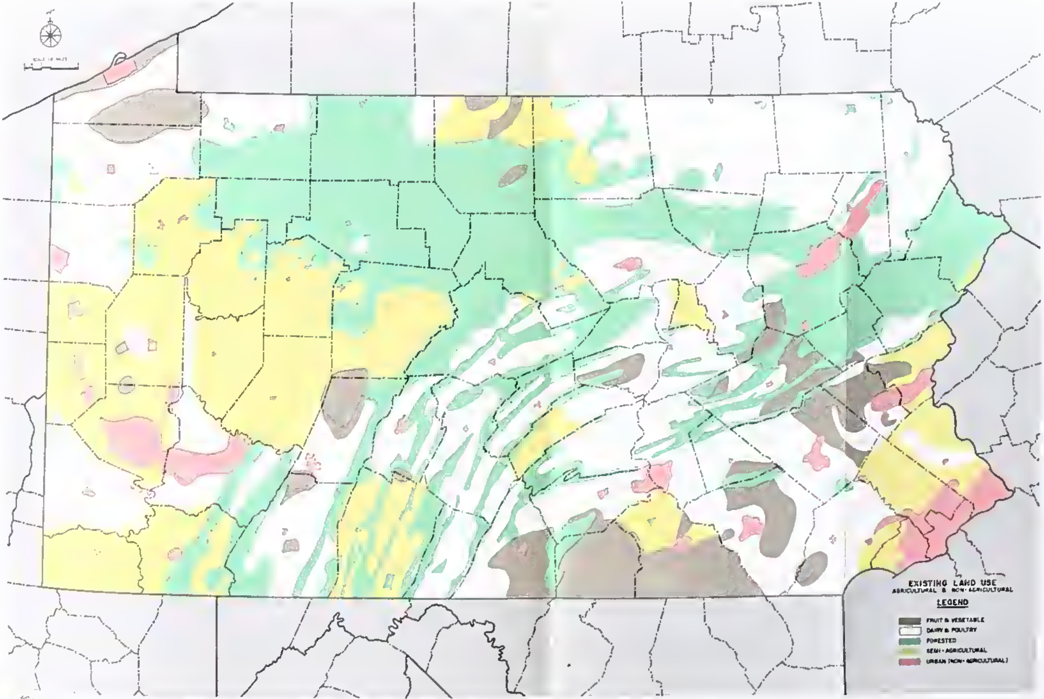
*Jean Gottman, *Megalopolis*, MIT Press, 1966.

FIGURE 3-4

EXISTING LAND USE
AGRICULTURAL AND NON-AGRICULTURAL



*Source: Pennsylvania Department of Highways, Bureau of Advance Planning, and the Pennsylvania State Planning Board

Furthermore, most of the economic development and population growth has been toward the southern side of the State in the vicinity of Pittsburgh, Harrisburg, and Philadelphia. Most indications are that past trends will continue and that population growth will continue chiefly in southern Pennsylvania through the end of this century as shown in Figure 3-5. However, there are some indications that transportation developments may be influencing a shift of economic and population growth away from the farming and industrial southern side of the State to the recreation-oriented northern half of Pennsylvania (See Figure 3-6) or even completely out of the State.

One example of the by-passing of southern Pennsylvania is the construction of Interstate 80 in the northern half of the State as the principal connection between Chi-Pitts and Megalopolis. Another example is the rerouting of 9.2 million train miles of rail traffic from the Pennsylvania Main Line to the water-level route through Erie and across New York State. Also, there is a possibility of loss of international waterborne commerce to Baltimore and New York as a result of containerization. The advent of containerization has special significance for southeastern Pennsylvania ports because:

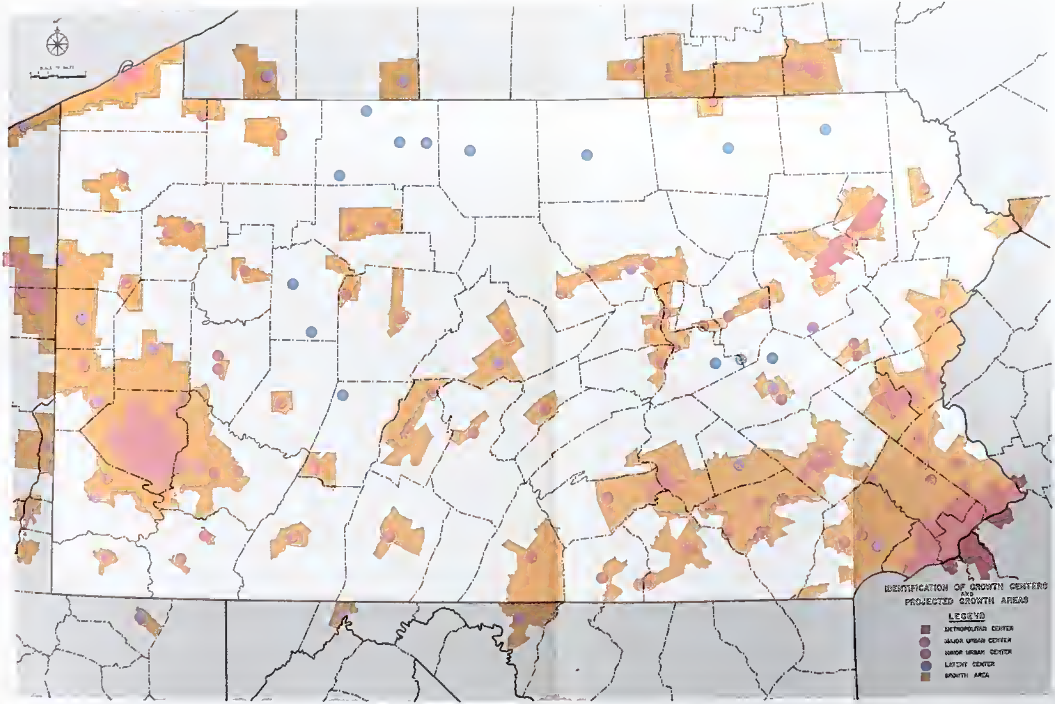
1. Containers are a device uniquely suited to "load center"; they favor big ports such as New York where many movements are channeled through a single point;

2. Container ship operators favor:
    a. berths near open sea
    b. large amounts of paved open areas
    c. tax-free terminals at modest rates

The competitive pressures on southeastern Pennsylvania ports are further accentuated because most Delaware River Ports contain terminals and inherently inefficient finger piers, built before 1955 which will be largely obsolete, although usable, by 1975. The use of containers for international trade will accelerate and probably mature by 1975. Countervailing forces which could work to the advantages of southeastern Pennsylvania ports are the modernization programs already underway and the extensive generation of international trade in semi-finished goods in southeastern Pennsylvania (See Figure 3-7). With proper port development

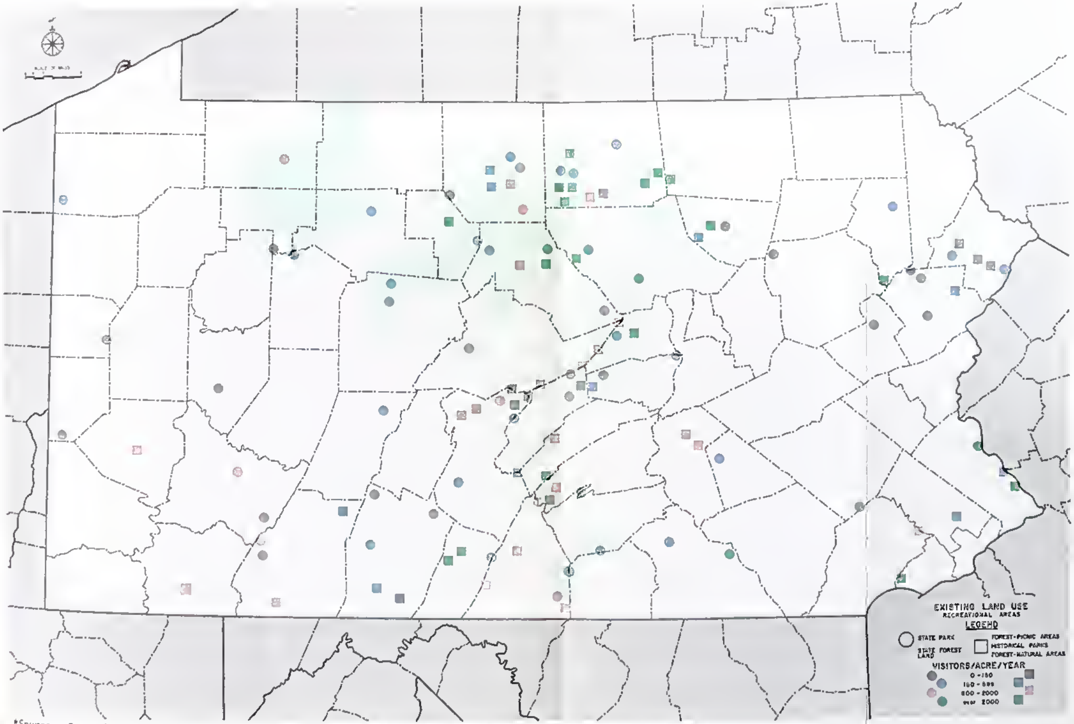
FIGURE 3-5

IDENTIFICATION OF GROWTH CENTERS AND PROJECTED GROWTH AREAS



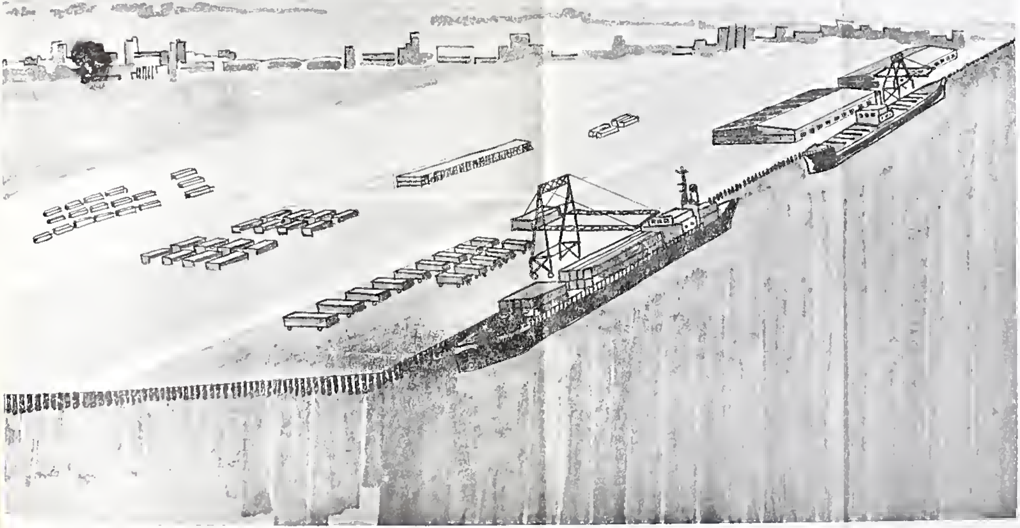
*Source: Pennsylvania Department of Highways, Bureau of Advance Planning, and the Pennsylvania State Planning Board

FIGURE 3-6
EXISTING LAND USE - RECREATIONAL AREAS



*Source: Pennsylvania Department of Highways, Bureau of Advance Planning, and the Pennsylvania State Planning Board

Figure 3-7. Container Handling at the Port of Philadelphia



shipping companies may be forced by economic pressures to come to the Philadelphia area to move the large volume of international freight generated there. This will be especially true if shipping companies engage in a great competitive battle for trade, as some experts expect to occur by 1975 when there may be overcapacity on container ships sailing in the Atlantic.

Another "load center" transportation development which will affect southeastern Pennsylvania is the advent of the Jumbo Jet (Boeing 747) and the Air Bus (McDonnell-Douglas DC-10 and Lockheed L-1011). These big aircraft will be able to move more with less crowding of air space. This will probably mean that the hold on air traffic, particularly international flights, by John F. Kennedy (JFK) International Airport in New York will be temporarily strengthened. Currently, about two-thirds of all trans-Atlantic flights go through JFK International Airport. Nevertheless, there will probably be more international flights serving Philadelphia and Washington, D.C., (and possibly Pittsburgh) by the mid 1970's. This will occur because of rapidly increasing demand for international flights.

Another eventual positive factor enhancing growth in southeastern Pennsylvania will be the development of high-speed ground transportation through southeastern Pennsylvania on the Northeast Corridor rail line. This development offers opportunities to attach a high-speed link to stations at Philadelphia and Trenton and influence desirable urban growth toward the interior of Pennsylvania. Southeastern Pennsylvania is strategically located between the two greatest financial and decision-making centers in the United States, Washington, D.C., and New York. Southeastern Pennsylvania can gain by improved transportation connections to those two cities because it can catch the overflow of service employment which these centers will generate in the coming years. Furthermore, a good high-speed rail connection between the Northeast Corridor rail line and Harrisburg combined with outstanding highway access to Baltimore and Washington, D.C. on Interstate 83 could have synergistic effects. Harrisburg could become an action center on the west side of Megalopolis where much open space is plentiful.

As recreation plays a larger role in the lives of Americans, Pennsylvania's open space will become increasingly desirable. Recent trends indicate that young people are more recreation-oriented than were their parents. Furthermore, young people are becoming more affluent at earlier ages. Some observers give these factors as reasons for the rapidly increasing ownership of summer homes and weekend retreats at recreation centers. Central Pennsylvania contains much public land and many recreation centers (See Figure 3-6). The implication is that there will be an opportunity to open up the recreation lands and primitive areas of central Pennsylvania by judicious construction of access roads.

One other interesting trend related to the habits of young people is their tendency to produce fewer children per household since 1960. This accounts for the expected leveling in enrollment in the schools across the country in the 1970's. Pennsylvania will follow the U.S. trend, at least through 1975. For example, Pennsylvania's first grade enrollment in 1975 will be approximately the same as it is now. With a break in the acceleration of educational expense and with the completion of interstate highway construction in the 1970's, there may be greater funds available for local transportation.

Analyses of the implications of social and economic forces for transportation developments in Pennsylvania are given in Appendix E for the thirteen planning regions of the Commonwealth.

3-8 Existing Rules and Regulations Which Could Influence PennDOT Actions

Most plans, trends, and activities mentioned thus far have been of such a nature as to suggest possibilities for construction projects and programs. However, there are other possibilities for making transportation improvements in Pennsylvania which would require PennDOT action, but which would be chiefly administrative in nature. These administrative activities would deal mainly with changes in PUC regulations, ICC regulations, and the Pennsylvania Constitution or with improvements for enforcing regulations. The changes would probably not be costly to PennDOT to implement, but they could have a great impact on the development of the Commonwealth.

Examples of administrative activities which a PennDOT might undertake are the encouragement of changes in the Pennsylvania Constitution to allow pledging of State credit to external organizations (See Appendix F) and changes in General Order 29 of PUC Regulations to allow interlining by trucking companies (See Appendix H-2 for details).

3-9 Delineation of Ideas for Projects and Programs

The principal purpose of the discussions in this section was to generate possible projects and programs which could be undertaken by a PennDOT administration. Several of the ideas discussed in this section plus those which are stated or implied in the Appendices are delineated in Table 3-1. However, the list contains only a selection of principal projects and programs from the universe of possibilities and some elements of federal, state and local plans were purposely omitted. Other transportation developments such as improved locks on navigable rivers, the SST, new facilities for unloading oil from supertankers, etc., are largely the responsibility of the Federal Government or private industry. Many such projects have been purposely excluded since they require little if any State funding or State direction.

In Table 3-1, the 93 projects and programs were grouped according to their 9 principal characteristics, *e.g.,* (I) Intercity Railway Improvements, (H) Intercity Highway Construction, etc. In some cases, such as that of "Keystone Corridor" construction, the complexity of alternatives associated with the program dictated subdivision inot several numbered project components. For some projects and programs, the study and implementation also were considered separately. The numbers attached to the projects are for purposes of identification and in no way reflect any assigned priorities of importance.

Costs were assigned to projects and programs by placing them in one of 16 cost range categories (Table 3-2) to reflect the uncertainties involved in cost estimation. If a project or program had been studied sufficiently, and implementation cost range was assigned. If a prior study had indicated a probable cost of implementation, that cost was written parenthetically under the estimated range in the implementation column. When not enough was known about a project or program to consider implementation , need for a feasibility study was designated by placing the estimated cost range of the study in the appropriate column by the project description. Additionally preliminary estimates were made of the cost ranges for implementing these projects and programs. In many cases these costs were very far from precise because of lack of available cost information. It will be necessary as part of the feasibility study to prepare better cost estimates in order to assess whether a given project is worthy of implementation. It should be recognized that occasionally two or more feasibility studies must be made before a decision can logically be made on implementation. However, according to our usage, "feasibility studies" are not to be confused with "engineering studies" which are made after the decision to implement has been made, *e.g.*, a decision to build an interstate highway through a corridor across the State implies a subsequent engineering study to determine the best specific route within the Corridor.

Finally, Table 3-1 shows in the right-hand column, estimated percentages of the total project investment costs which the State Government would incur in carrying out the projects and programs listed. The probable share of the cost to be funded by the State was largely based on current federally funded programs in Appendix B. Where two percentages are shown for a given project, the first applies to the feasibility study and the second to implementation. The costs to the State were used in the next step of the planning process to evaluate the relative merits of the alternative projects and programs in order to select the ones which were included in the recommended Interim Master Plan.

Table 3-1. Programs and Projects to be Evaluated

Program or Project	Component		Estimated Cost* Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%) †
	Number	Description	Study	Implementation	
		(R) INTERCITY RAILWAY IMPROVEMENTS			
Keystone Corridor Implementation	R-1	Purchase right-of-way between Pittsburgh and Harrisburg		20,000-50,000 ($20 million)	100
	R-2	Purchase right-of-way between Ohio border and Pittsburgh		5,000-20,000 ($5 million)	100
	R-3	Purchase right-of-way between Harrisburg and Trenton, New Jersey. Right-of-way would run near Lansdale, Pottstown, Reading, and Lebanon.		100,000-500,000	100
	R-4	Build two sets of medium speed railroad tracks (90 mph) on new right-of-way between Pittsburgh and Harrisburg		100,000-500,000 ($138 million)	100
	R-5	Build two sets of medium speed (90 mph) railroad tracks and two sets of high-speed (150 mph) railroad tracks on new right-of-way between Pittsburgh and Harrisburg		100,000-500,000 ($276 million)	100
	R-6	Rebuild existing two tracks between Harrisburg and Philadelphia to provide 90 mph speed		20,000-50,000	100
	R-7	Same as project R-6 except also construct two sets of high-speed (150 mph) tracks using part of the right-of-way between Harrisburg and Philadelphia		100,000-500,000	100

*Total cost of study or implementation of project, *i.e.*, cost to State plus cost to any agency or organization which may match State funds.

†Where two percentages are shown for a project, the first applies to the feasibility study and the second to implementation.

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(R) INTERCITY RAILWAY IMPROVEMENTS			
	R-8	Combine projects R-1, R-2, R-4, and R-6 with appropriate rail construction to give 90 mph cruising speeds across the State		100,000-500,000	100
	R-9	Combine projects R-1 and R-2 with appropriate rail construction to give 150 mph cruising speeds across the State - Ohio border to Harrisburg		1,000,000-2,000,000 *($1.5 billion)	100
	R-10	Combine Projects R-1, R-2, and R-3 with appropriate rail construction to give 150 mph cruising speeds across the State - Ohio border to Trenton, New Jersey		2,000,000-4,000,000	100
Keystone Corridor Study	R-11	Study feasibility of alternative Keystone Corridor concepts —— specify demand, economic viability, prefered route, and configuration	200-400	See R-1 to R-10	100
Study of Equipment Requirements for Harrisburg-Philadelphia Rail Service	R-12	Based on success of initial service, study requirements for additional cars (demand analysis) and track upgrading on Philadelphia-Harrisburg track, *e.g.*,	100-200		100
		(1) Upgrade the existing Harrisburg-Philadelphia tracks to give a maximum cruising speed of 100 mph; reduce the time in transit from 1 hour - 42 min to 1 hour - 30 min		20,000-50,000 ($32 million)	100

***Probable source of $1.5 Billion not determined.**

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range[2] (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(R) INTERCITY RAILWAY IMPROVEMENTS			
		(continued from previous page)			
		(2) Upgrade the existing Harrisburg-Philadelphia tracks to give a miximum cruising speed of 115 mph; reduce the time in transit from 1 hour - 42 min to 1 hour - 18 min		20,000-50,000 ($47 million)	100
		(3) Make track and right-of-way improvements to give a maximum cruising speed of 150 mph; reduce the time in transit from 1 hour - 42 min to 1 hour - 9 min		100,000-500,000 ($143 million)	100
Study to Develop an Optimum Terminal Plan for Harrisburg	R-13	Study the costs, benefits, and social impacts of alternative terminal configurations for the Harrisburg Metropolitan Area.	100-200	See R-14 to R-16	100
Renovation of Harrisburg Station	R-14	Renovate the Harrisburg Station; add air conditioning and a high-level platform; add parking for 100 autos		1,000-5,000 ($2.1 million)	17
Construction of New Downtown Harrisburg Station	R-15	Build a new station in downtown Harrisburg with a parking garage for 400 additional autos		5,000-20,000 ($8.8 million)	17

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(R) INTERCITY RAILWAY IMPROVEMENTS			
Construction of New Terminal at Olmsted State Airport	R-16	Build a new terminal at Olmsted State Airport to serve both rail and air passenger traffic; the temporary terminal at Olmsted State Airport, which serves Harrisburg, is now less than 100 yards from the main line of the Penn Central and 3 miles from the E. Harrisburg exit of the Pennsylvania Turnpike		5,000-20,000	17
Minor Improvements of Selected Rail Stations	R-17	Make needed improvements to Paoli, Downingtown, Coatesville, Lancaster, and Elizabethtown Stations		100-200 ($190,000)	17
Study Intermodal Freight Forwarding Terminal Requirements in Philadelphia	R-18	Study feasibility of constructing a large-scale terminal at Philadelphia which would be used for intermodal handling of containers and truck trailers. Conceptually, the terminal would include leased space for break-bulk and stuffing operations.	50-100		100
				20,000-50,000	50
Study Intermodal Freight Forwarding Terminal Requirements in Pittsburgh	R-19	Study feasibility of an intermodal freight forwarding terminal at Pittsburgh (like Project R-18)	50-100		100
				20,000-50,000	50

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
(R) INTERCITY RAILWAY IMPROVEMENTS					
Study Intermodal Freight Forwarding Terminal Requirements in Harrisburg	R-20	Study feasibility of an intermodal freight forwarding terminal at Harrisburg (like Project R-18)	50-100	5,000-20,000	100 50
Study Intermodal Freight Forwarding Terminal Requirements in Wilkes-Barre-Scranton	R-21	Study feasibility of an intermodal freight forwarding terminal at Wilkes-Barre-Scranton (like Project R-18)	50-100	5,000-20,000	100 50
Study Intermodal Freight Forwarding Terminal Requirements in Erie	R-22	Study feasibility of an intermodal freight forwarding terminal at Erie (like Project R-18)	50-100	5,000-20,000	100 50
Grade Crossing Elimination Study	R-23	Study railroad crossings in the State with the objective of eliminating grade crossings which present the greatest potential safety hazards (the cost per grade crossing elimination would average about $450,000)	20-50	100,000-500,000	100 50
Northeast Corridor Track Improvement at Philadelphia	R-24	Realign five restricting curves and several junctions in Philadelphia which greatly slow the high-speed trains. If this is not done, federal authorities may develop a Philadelphia by-pass which would reduce N.E. Corridor train service in downtown Philadelphia		20,000-50,000	17

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
(U) URBAN COMMUTING AND METROPOLITAN TRANSPORTATION					
Study of Hovercraft for Urban Communities and Demonstration	U-1	Study possibilities of using hovercraft on the waterways near Pittsburgh, Philadelphia, Harrisburg, and Erie for commuting and recreation and fund demonstration in one location if economically viable	50-100	1,000-5,000	100 17
Rail Link Construction Between the Penn Central Suburban and Reading Terminals in Philadelphia	U-2	Construct underground connecting rails between the Pennsylvania and Reading Terminals; the distance is about 5 blocks		20,000-50,000 ($50 million)	17
Underground Conveyor Construction in Center City Philadelphia	U-3	Construct an underground belt conveyor for passengers between the Pennsylvania and Reading Terminals and other points under the Penn Center Complex		5,000-20,000	17
Demonstration of Electric Cars in Philadelphia	U-4	Demonstrate use of electric cars in urban areas (in conjunction with 1976 Philadelphia Bicentennial)		1,000-5,000	17
Demonstration Programs for the Rail-Bus in Philadelphia, Harrisburg, and Pittsburg	U-5	Financing of railbus demonstration programs at Pittsburgh, Harrisburg, and Philadelphia		700-1,000	17

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
(U) URBAN COMMUTING AND METROPOLITAN TRANSPORTATION					
Study of Aerial Tramway Across River at Pittsburgh	U-6	Study comparative costs, benefits, and social impacts of an aerial tramway from the Golden Triangle to Duquesne Heights; the tramway could conceptually be used in conjunction with a parking garage for commuters, for city-airport connections, or access to a luxury hotel.	100-200	5,000-20,000	100 17
Study of Subsidies for Commuter Transportation	U-7	Study feasibility of guaranteeing private transit companies and public authorities a break-even or reasonable return on investment for providing adequate service	50-100	20,000-50,000	100 100
Financing of Transit Re-equipment in Urban Areas	U-8	Partially finance re-equipment programs of the Port Authority of Allegheny County——275 new buses		1,000-5,000 ($1.6 million)	17
	U-9	Partially finance SEPTA in purchases of 300 new buses		1,000-5,000 ($1.75 million)	17
	U-10	Partially finance bus improvement programs at Scranton, Harrisburg and other cities where there is a need for bus service		700-1,000	17
	U-11	Partially finance re-equipment of commuter rail service in Philadelphia——60 rail cars		5,000-20,000 ($16.2 million)	17

Table 3-1. Programs and Projects to be Evaluated (Continued)

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(U) URBAN COMMUTING AND METROPOLITAN TRANSPORTATION			
Study of Alternative Methods of Urban Transit	U-12	Study comparative costs, benefits, and social impacts of alternative methods of urban transit in Philadelphia and Pittsburgh	400-700	100,000-500,000	100 17
Study of Jitney Service in Pennsylvania's Major Cities	U-13	Study feasibility and costs of a program for guiding and financing jitney service particularly in the ghetto areas. Jitney service may have the capability of providing protection and employment opportunities in areas where they are needed, where car ownership is low, and where bus service cannot provide doorstep pick-ups and deliveries. Jitneys carrying guards at night could be used to provide a benign municipal presence and safe public transportation vehicles.	20-50	1,000-5,000	100 17
Survey and Study of Existing Right-of-Way Availability	U-14	Survey abandoned and nearly abandoned railroad right-of-ways to connect suburban areas with city centers. Study new systems for carrying commuters on currently underutilized right-of-ways.	200-400	100,000-500,000	100 17
Philadelphia Subway Extension	U-15	Construct extensions of Broad Street Subway in Philadelphia recommended by the Delaware Valley Regional Planning Commission and SEPTA		100,000-500,000 ($124 million)	17
Extension of Hatboro Line	U-16	Construct 2-mile extension of Hatboro Rail Commuter Line to Johnsville		5,000-20,000	17

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(U) URBAN COMMUTING AND METROPOLITAN TRANSPORTATION			
Purchase of "Skycrane" Helicopter for Removing Disabled Vehicles	U-17	Purchase "Skycrane" helicopter for help in removing disabled cars which create traffic tie-ups and which are not easily accessible by tow trucks. The "Skycrane" helicopter, currently being used for container movements in South East Asia, has a lift capacity of 10 tons in warm weather		5,000-20,000 ($5 million)	17
Study of Controversial Freeways	U-18	Study economic feasibility, social impact, and alternative solutions for controversial freeways in metropolitan areas, *e.g.*,	700-1000		100
		(1) Crosstown Expressway in Philadelphia (linking Delaware and Schuylkill Expressways)		50,000-100,000 ($60 million)	50
		(2) Oakland Crosstown Freeway (5.3 miles of freeway from Route 51 near Overbrook to a point on Fifth Avenue in Oakland; would carry traffic across the Monongahela River and act as shunt for South Hills traffic around the overloaded Liberty Tubes and Fort Pitt Tunnels)		50,000-100,000 ($87 million)	50
		(3) Pittsburgh-McKeesport Freeway (13 miles of freeway beginning at the Hays end of the new Sherwood Bridge, and extending past		20,000-50,000 ($41 million)	50

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(U) URBAN COMMUTING AND METROPOLITAN TRANSPORTATION			
		(continued from previous page)			
		Lincoln Place across the Monongahela River to Route 48)			
		(4) Extension of Beaver Valley Freeway (5 miles of freeway from Route 251 north of Beaver Falls to the Lawrence County Line)		5,000-20,000	50
		(5) West Shore Expressway (Cumberland County)		20,000-50,000	50
Liberty Tubes Study	U-19	Study economic feasibility and social impact of tunnels parallel to the existing Liberty Tubes to relieve congestion, particularly for traffic to and from South Hills during rush hours	50-100	5,000-20,000	100 50
Skybus Transit Study	U-20	Study alternative routes for Skybus demonstration, *e.g.*,	50-100	See U-21	100
		(1) from Bethel Park to Fourth Avenue via the Wabash tunnel			
		(2) from Bethel Park to Penn Central Park			
Skybus Transit Demonstration	U-21	Conduct demonstration of Skybus transit on selected route		100,000-500,000 ($100 million)	17

Table 3-1. Programs and Projects to be Evaluated (Continued)

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
(U) URBAN COMMUTING AND METROPOLITAN TRANSPORTATION					
Construction of Parking in Philadelphia	U-22	Finance construction of 2000 parking spaces in or near Center City Philadelphia		5,000-20,000 ($10 million)	17
Construction of Parking in Pittsburgh	U-23	Finance construction of 2000 parking spaces in or near downtown Pittsburgh		5,000-20,000 ($10 million)	17
Construction of Parking in Other Large Cities	U-24	Finance construction of a total of 4000 parking spaces in downtown areas of the third through the fifteenth largest cities in Pennsylvania		5,000-20,000 ($15 million)	17
Construction of Parking at Ends of Transit Lines in Philadelphia and Pittsburgh	U-25	Finance construction of 50,000 peripheral parking spaces at ends of transit lines in Philadelphia and Pittsburgh		100,000-500,000 ($100 million)	17
Sponsorship of Helicopter Rescue Service	U-26	Provide helicopters and pilots for medical rescue service in cases where ambulances could not provide fast service, *i.e.*, when traffic is snarled on an expressway or when snow and ice rule out fast ground transportation		1,000-5,000	50
Study Construction of Exclusive Bus Lanes on Urban Freeways	U-27	Study costs, benefits, and feasibility of constructing extra lanes for exclusive bus use. The lane would be one way into the city each morning and one way out of the city each weekday evening.	100-200	100,000-500,000	100 50

Table 3-1. Programs and Projects to be Evaluated (Continued)

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(H) INTERCITY HIGHWAY CONSTRUCTION			
Completion of the Second 6-Year Highway Program	H-1	Construct 486 improvements which include carry-over from the first 6-year Highway Improvement Program, initiated July 1, 1965, with the additions suggested in 1967. The 486 improvements would chiefly constitute completion of the interstate program and upgrading existing routes to carry more traffic at higher speeds. About 12% of the required funds would go to the 2-county Pittsburgh District and about 23% would go to the 5-county Southeastern Pennsylvania District, which includes Philadelphia. The initial 6-year program called for spending a total of $3.4 billion to build new interstate highways and improve existing highways.		2,000,000-4,000,000 ($3.2 billion)	50
Remedy of Major Highway Deficiencies (Identified in TAC Projects 4 and 5)	H-2	Construct 285 improvements on links analyzed by TAC Projects 4 and 5 and indicated as likely to be capacity deficient by 1975 (capacity measured under desirable conditions)		1,000,000-2,000,000 ($1.5 billion)	50
Study Release of 11,000 Miles of State Owned Highway to Local Government	H-3	Study mechanisms by which secondary state roads particularly in well-populated boroughs and townships can be transferred to local authorities in an acceptable manner. The State Highway Department cannot provide adequate maintenance and check regularly for deficiencies on many roads. Local authorities could be more	20-50	200-400	100 100

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Common-wealth (%)
	Number	Description	Study	Implementation	
(H) INTERCITY HIGHWAY CONSTRUCTION					
		(continued from previous page) immediately responsive to repairing breaks, holes, and deficiencies than could a statewide organization in many cases. However, local authorities are often not prepared or equipped to take on the new responsibilities. A study would hopefully give some estimate on efficiencies to be recognized and mechanisms by which transfer programs could successfully be carried out.			
6-Year Safety Improvements	H-4	Improve highways at 224 *accident cluster* locations		5,000-20,000 ($14 million)	50
	H-5	Improve 614 hazardous or potentially hazardous locations on *school bus routes*		50,000-100,000 ($51.5 million)	50
	H-6	Improve 452 *potentially* hazardous locations which were identified by district highway agencies		20,000-50,000 ($45.3 million)	50
Study Needs for an Erie-Philadelphia High-Speed Highway	H-7	Study needs for improving and upgrading highways beyond the requirements of the 6-year improvement programs between Harrisburg and the State College Intersection of Interstate 80; between DuBois and Erie through the southwestern edge of the Allegheny National Forest.	100-200	100,000-500,000	100 50

Table 3-1. Programs and Projects to be Evaluated (Continued)

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(H) INTERCITY HIGHWAY CONSTRUCTION			
		(continued from previous page) Such improvements would greatly help passengers traveling across one diagonal of the State and help open up recreation areas in the least densely populated regions of the State			
Demonstration and Evaluation of the Use of Electronic Merge Signals at Hazardous Interchanges	H-8	Demonstrate and evaluate the viability of electronic warning signals for merging traffic at selected interchanges on interstate highways		400-700	50
Demonstration and Evaluation of Automatic Truck Weighing Devices	H-9	Demonstrate and evaluate automatic weighing plates in highways at strategic points so that each truck can be weighed while it is in motion. Violators could easily be apprehended and fined. The benefits would be in reducing road wear and insuring against overloading bridges.		400-700	50

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(I) INDUSTRIAL DEVELOPMENT SUPPORT			
Establishment of an Emergency Fund for the State Department of Commerce	I-1	Establish an Emergency Fund to build short access roads from existing highways to prospective plant locations when company officials will commit to build plants on the properties. This would make Pennsylvania more competitive with other states which offer such inducements.		1,000-5,000	100
Improvements for Handling General Cargo at the Port of Philadelphia	I-2	Provide improvements for handling general cargo at the Port of Philadelphia. The Port of Philadelphia needs several large PACECO-type cranes etc., in order to be competitive with Ports of Baltimore and New York in handling containers.		1,000-5,000	50
Study of Container Terminal and Industrial Complex at Chester, Pennsylvania	I-3	Investigate possibilities for building a container terminal and industrial complex at Chester, Pennsylvania. There is considerable acreage of land near Chester, Pennsylvania, near a 40-foot channel, where a large container port might be built. The area has been selected by the Delaware River Port Authority for such development. Such a development, however, would be in conflict with plans of the Philadelphia Port Corporation.	50-100	20,000-50,000	100 50

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
(I) INDUSTRIAL DEVELOPMENT SUPPORT					
Study Barging General Cargo in Containers from Philadelphia to Baltimore	I-4	Baltimore is often a first stop for general cargo ships. If cargo is sent to Baltimore for combination with shipments originating there, faster service might be provided to Philadelphia manufacturers who have international shipments.	50-100	5,000-20,000	100 50
Improve Coal Loading Facilities at Port of Philadelphia	I-5	The existing coal loading facilities at the Port of Philadelphia are antiquated and inefficient. Little coal is now shipped through the Port. Perhaps more efficient equipment could inspire use of the Port for international shipments and improve the coal mining production in the State.		1,000-5,000	50
Study Feasibility and Benefits of a Pennsylvania Land-Bridge between the Ohio River and the Delaware River	I-6	Study the possibilities of facilitating the movement of materials between barge and rail, barge and truck, and barge and pipeline for movements across Pennsylvania. There is some indication that there are considerable user-producer relationships between gulf coast plants and east-coast plants particularly in the chemical industries. This suggests possibilities for barge connections on the Ohio River at Pittsburgh with transfer across the State to and from the Philadelphia Area.	100-200	5,000-20,000	100 50

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(I) INDUSTRIAL DEVELOPMENT SUPPORT			
Construction of a Lake Erie to Ohio River Canal	I-7	The Corps of Engineers has delineated a best route between Lake Erie, near Fairport, Ohio, and the Ohio River near Beaver Falls, Pennsylvania. The Canal would go through Youngstown, Ohio, and New Castle, Pennsylvania		1,000,000-2,000,000 ($1.06 billion)	10
Study of Delaware River Channel Requirements	I-8	The Corps of Engineers has investigated possibilities of deepening the channel to 50 feet and determined that costs considerably outweighed benefits. The Corps is currently investigating possibilities of deepening the channel to 45 feet. Deepening would primarily benefit bulk oil ships and ore shipments. The existing channel is deep enough for general cargo ships afloat and now being built. A PennDOT's role would be in helping the Corps of Engineers justify the channel deepening project.	50-100	2,000,000 - 4,000,000	100 10
Study of the Establishment of Foreign Trade Zones in Pennsylvania	I-9	U.S Customs regulations permit adding value to imported commodities, without the usual import duties at established foreign trade zones. There are now five such zones in the continental U.S. One of the five has expanded into a sub-zone. Pennsylvania has no such zones. Perhaps severaltrade zones could be established in Pennsylvania with appropriate bonded	50-100	20,000-50,000	100 100

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(I) INDUSTRIAL DEVELOPMENT SUPPORT			
		(continued from previous page) transportation networks for interconnection. The study will determine the cost and benefits and feasibility of establishing such trade zones in the State.			
Survey and Study of Clearance Requirements and Regulatory Revisions	I-10	Survey clearances of existing and proposed tunnels, bridges, underpasses, and pipelines; study requirements, including safety, to insure that the largest foreseeable vehicles and containers which might advantageously pass through will have adequate clearance; and recommend revisions in regulations. Expand existing passages where it would be economically justifiable to do so for land development purposes	200-400	100,000-500,000	100 50

Table 3-1. Programs and Projects to be Evaluated (Continued)

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(A) AIRPORT ACCESS AND FACILITIES IMPROVEMENTS			
Study of International Flights at Greater Pittsburgh Airport	A-1	Study and investigate inducements needed by air carriers to establish international flights to and from the Greater Pittsburgh Airport. Consider building an air cargo terminal which would house a customs office.	50-100	5,000,20,000	100 50
Study of Heliports and STOL Airports in Urban Areas	A-2	Study the heliport and STOL airport needs and availability of suitable space at Pennsylvania's sixteen largest cities	100-200	100,000-500,000	100 50
Study of High-Speed Transit System to the Greater Pittsburgh Airport	A-3	Study alternative airport transportation possibilities, such as the Skybus and Monorail, and estimate the costs, benefits, and social impact of the proposed systems.	50-100	50,000-100,000	100 17
Construction of High-Speed Transit System to Philadelphia International Airport	A-4	Construct connections, switching facilities, waiting rooms, etc., onto the existing rail network for providing high-speed rail transportation between a Market Street East Terminal and the Airport with stops at Penn Center, 30th Street Station, and the Civic Center parking lot.		20,000-50,000 ($20 million)	17
Survey of Airport Terminal Operations and Study of Requirements	A-5	Study of alternatives for facilitating passenger throughput at the terminals with greater comfort and convenience at all Pennsylvania airports with scheduled airline service.	100-200	20,000-50,000	100 50

Table 3-1. Programs and Projects to be Evaluated (Continued)

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(continued from previous page) Specifically, include study of parking requirements and capacity, including distribution systems. Also, investigate alternative methods for supporting terminal operations if airport concessions are removed from the terminal buildings to make room for greater surges of passenger traffic. (As much as one half or more of the revenues required to operate some airports are derived from concessions at the terminal.)			
Survey of General Aviation Airports and Study of Requirements in Pennsylvania	A-6	Inventory land, buildings, etc., at general aviation airports and categorize by aircraft handling capability. Investigate possibilities for developing industrial parks at the airports. Study costs and benefits of upgrading existing facilities and building new facilities, including new airports.	100-200	50,000-100,000	100 50
Study of General Aviation Congestion in Philadelphia and Pittsburgh	A-7	Study of regional general aviation airport and airspace congestion in the Philadelphia and Pittsburgh greater metropolitan areas and evaluation of requirements for new general aviation facilities	50-100	20,000-50,000	100 50

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(T) TOURISM AND RECREATION			
Construct Distribution Roads Near the Tocks Island Project	T-1	Construct adequate distribution roads in Pike, Monroe, and Northampton Counties. The Tocks Island project of the Corps of Engineers is directed toward developing one of the greatest outdoor recreation areas in the East by the late 1970's. Existing roads in the area of the project were constructed long ago for only light use.		20,000-50,000 ($44.6 million)	50
Construct Access Roads to Primitive Areas	T-2	Construct access roads to primitive areas, particularly those in the central part of the state and the southwestern area in the vicinity of the Pennsylvania Turnpike and Interstate 80. Access roads might also double as dams where running water is available and lakes are few.		5,000-20,000	50
Construct Scenic Parkways	T-3	Financially support the Appalachian Regional Commissions plans to upgrade 100 miles of roads in Central Pennsylvania. Add additional loop route construction on mountain ridge lines and through scenic valleys.		100,000-500,000	50

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(G) GENERAL DEVELOPMENT			
Joint Study of New Pennsylvania City with Department of Commerce	G-1	Initiate a joint study of new city in Pennsylvania with Department of Commerce. Specifically study the requirements for the transportation infrastructure.	50-100	1,000,000 - 2,000,000	100 50
Establishment of Emergency Fund for State Planning Board to Assist on Transportation Planning Problems	G-2	Transportation-related problems arise which require the assistance of the State Planning Board. The need to zone around new road construction, and recreation developments are examples of such requirements for their assistance. However, the small staff of the State Planning Board must operate on a limited budget. It could be helpful to have available funds which could be transferred to the State Planning Board when the requirements for their services are so great or so urgent that their budget must be quickly supplemented in order to obtain needed assistance.		200-400	100

Table 3-1. Programs and Projects to be Evaluated (Continued)

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(W) WASTE DISPOSAL			
Study of Alternatives for Disposing of Dredgings from Pennsylvania Waterways	W-1	The Corps of Engineers will be greatly handicapped in continuing its dredging operations on the Delaware River if current protests against dumping dredgings continue. The Corps has been restrained against condemning land for such purposes several times during the past five years. Any assistance in solving their disposal problem would help assure that the channels are maintained or perhaps even deepened. The study will explore alternative means of disposing of dredgings from the Delaware River.	50-100	5,000-20,000	100 50
Study Feasibility of Waste Pipelines	W-2	Conceptually, large pipelines would be constructed to collect and carry industrial and untreated household wastes to storage and land fill areas.	100-200	20,000-50,000	100 50
Study of Backhauling Municipal Garbage and Trash in Freight Cars	W-3	Many freight cars (*e.g.*, coal hopper cars) return empty from municipal power plants and steel mills to the coal mine areas. These cars might be used for carrying out garbage and trash to suitable land fill projects, *i.e.*, filling in strip mines. Problems to be overcome include keeping the material from blowing out of the cars, finding a fast way to load	100-200	1,000-5,000	100 50

Table 3-1. Programs and Projects to be Evaluated (Continued)

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(W) WASTE DISPOSAL			
		(continued from previous page) and unload the cars, and distributing the material in the land fill area. The study should determine the preferred approach to backhauling and estimate the costs and benefits.			

Table 3-1. Programs and Projects to be Evaluated (Continued)

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(L) ADMINISTRATION, LEGISLATION, AND REGULATION			
Study of Impact of Allowing Multiple Bottom Trailers on Pennsylvania Highways	L-1	Neighboring states now allow double bottoms, *i.e.*, two tandem truck trailers, to be pulled across their interstate highways and on certain selected roads. Pennsylvania does not permit double bottoms to cross the State line. Truckers say that Pennsylvania represents a barrier to them and results in poorer service not only to Pennsylvanians but to companies in neighboring states also. Opponents say that tandem trailers are unsafe. Some western states allow three tandem trailers on their interstate highways and at selected turnouts, so long as the total length of the truck train does not exceed 105 feet. The study should determine the costs, benefits, and impact of allowing multiple bottom trailers on Pennsylvania highways.	100-200	200-400	100 100
Study Role of PennDOT in Assisting PUC and ICC	L-2	A PennDOT might help enforce PUC and ICC regulations which would benefit the law abiding truckers who use the State highways (*e.g.*, at truck weighing stations). Perhaps there are areas where joint efforts could lead to operating efficiencies, for example, in insuring that truckers do not carry commodities which they are not licensed to carry.	20-50	100-200	100 100

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
(L) ADMINISTRATION, LEGISLATION, AND REGULATION					
Study to Develop Plans for Changing General Order 29 of the PUC to Allow Interline Arrangements by Motor Carriers	L-3	When truckers haul commodities with origin and destination in Pennsylvania, they are prohibited from negotiating among themselves agreements on through shipments. This is true, even when each has been granted routes such that the tacking together of the routes would provide the origin-destination movement desired by the shipper. Thus, the shipper must find the trucker which has the prescribed origin-destination route, negotiate with several truckers for a circuitous routing, or wait until a trucker successfully goes before PUC to petition for a desired route should no trucker have been granted permission to ship between the origin-destination pairs designated by the shipper.	10-20	50-100	100 100
Study of Hazardous Material Movement in Pennsylvania	L-4	State law provides that certain "hazardous" materials cannot be moved by truck through tunnels. However, the same hazardous materials, in some cases, must then be transported through the business districts of small towns and over treacherous, narrow roads, perhaps presenting even more of a hazard. Study existing practices in transporting hazardous materials and alternatives, such as roads which circumvent the tunnels on the Pennsylvania Turnpike.	50-100	20,000-50,000	100 50

Table 3-1. *Programs and Projects to be Evaluated (Continued)*

Program or Project	Component		Estimated Cost Range (thousands of dollars)		Probable Share of Cost to be Funded by Commonwealth (%)
	Number	Description	Study	Implementation	
		(L) ADMINISTRATION, LEGISLATION, AND REGULATION			
Study the Use of Electronic Monitoring to Apprehend Law Violators	L-5	A host of electronic gadgetry is being developed to aid in law enforcement. PennDOT's rôle in the electronic equipment would be in evaluating the equipment by conducting demonstration projects, such as registering license numbers of cars which exceed the speed limit by more than 5 mph.	200-400	5,000-20,000	100 50
Study of Reducing Air Pollution Caused by Auto Exhaust	L-6	Study regulations and costs and benefits of use and enforcement of equipment which would help reduce air pollution	50-100	50,000-100,000	100 50
Study of Noise Caused by Transport Vehicles	L-7	Study the economics and social acceptance of noise near airports, on highways, and near railroad operations	50-100	20,000-50,000	100 50
Study Amending the State Constitution to Allow Pledging of the States Credit to Support Any Worthwhile Transportation Project	L-8	The existing Pennsylvania State Constitution prohibits pledging the State's credit to support any undertaking by a private enterprise. There are pros and cons of such regulation. One reason for changing the regulation would be to attract more private investment in transportation projects for the common good without necessarily expending State funds.	20-50	100-200	100 100

Table 3-2. Cost Range Categories

CATEGORY	COST RANGE ($1000's)
1	under 10
2	10 - 20
3	20 - 50
4	50 - 100
5	100 - 200
6	200 - 400
7	400 - 700
8	700 - 1000
9	1000 - 5000
10	5000 - 20,000
11	20,000 - 50,000
12	50,000 - 100,000
13	100,000 - 500,000
14	500,000 - 1,000,000
15	1,000,000 - 2,000,000
16	2,000,000 - 4,000,000

SECTION 4
EVALUATION OF ALTERNATIVES

4-1 General Evaluation Approach

A crucial issue in the development of this Interim Master Plan has concerned the selection of those projects for PennDOT which would best serve the transportation planning goals of the Commonwealth. Almost any project to modify Pennsylvania's transportation system outlined in the preceding section will seem desirable to some citizens and undesirable to others. For example, construction of an urban freeway will immediately satisfy the goals of reduced travel time and increased travel opportunities but will also be contrary to the social goals of reduced noise, enhanced visual aesthetics, and reduced air pollution. Furthermore, many proposed projects will involve localized benefits with the costs spread Statewide. How than can decisions be made as to what transportation improvements to make for whose benefit? It is clear that there is no "right" answer to this question and that there never will be. A resolution of this problem requires a definitive statement of the relative importance of all possible planning goals, and the difficulty, illustrated above, is that pursuing one objective will typically deny another. Thus, the only theoretically valid procedure for ranking projects would be through a vote of all citizens of the Commonwealth, and even that ranking would doubtless be of ephemeral interest, since what people value highly today may be of little concern tomorrow.

In the absence of any empirical data about the relative values which Pennsylvanians attach to transportation planning goals, one approach for initiating project evaluation is to weight all the goals arbitrarily and examine the sensitivity of project selection to the alternative weightings. This is the approach which has been followed in the development of this plan.

The recommended Interim Master Plan was based on selecting from all the alternative projects and programs those which were most beneficial in terms of goal satisfaction and which could also be purchased within a specified budget level. The following steps were involved in this evaluation process:

1. Definition of benefit categories;
2. Rating each proposed project in terms of the relative amount of benefits in each benefit category anticipated from it;
3. Normalization of the benefits assigned in Step 2;
4. Estimation of the anticipated project costs to the Commonwealth;
5. Relative ranking of the transportation goals and benefit categories;
6. Determination of probable PennDOT budgets for new projects;
7. Benefit-cost calculations to select projects.

The details of each of these steps are given below.

4-2 Definition of Transportation Benefits

In order to evaluate the extent to which the goals defined in Section 3 will be achieved by the alternative projects proposed for PennDOT in Section 4, it was necessary to define benefit categories which could be used to measure goal achievement. The nine benefit categories used in the development of this plan are given in Table 4-1 and defined below.

The benefit called *increased capacity* in Table 4-1 pertained to improvements in the throughput capability of a given transportation facility which did not necessarily make increased travel speeds possible. It could be measured as the expected volume of additional freight or passenger traffic to be moved per unit time.

The benefit of *increased travel speed* given in Table 4-1 was considered to result from improvements which decreased travel time. It could be measured by the expected amount or percentage of total trip time to be saved on a given journey.

Improved safety was included in Table 4-1 to reflect the decreased hazards achieved by transportation improvements. It could be measured by the expected reduction in accident rates and the decreased rates of death, injury, and property damage attributable to such accidents.

TABLE 4-1

NINE TRANSPORTATION BENEFITS USED IN PROJECT EVALUATION

1. Increased Capacity
2. Increased Travel Speed (Decreased Travel Time)
3. Improved Safety
4. Improved Comfort and Convenience
5. Cost Savings and Efficiency
6. Enhanced Economic Development
7. Increased Tourism and Enhanced Recreational Opportunities
8. Improved Land Use
9. Enhanced Social Values

The benefit of *improved comfort and convenience* in Table 4-1 pertained to the comparative comfort and convenience of the alternatives, except that the convenience for public transport projects can be measured in terms of the anticipated headway between conveyances.

The benefit of *cost savings and efficiency* in Table 4-1 pertained to the dollars per year of savings anticipated from a given project and/or to the expected increased amount of utilization of currently idle capacity.

The *enhanced economic development* benefit of Table 4-1 pertained to the amount of anticipated increase in the employment base of the State per given industry group. It was intended to subsume all the economic development goals of Table 2-1.

The *increased tourism and enhanced recreational opportunities* benefit in Table 4-1 pertained to increasing tourism and recreation by improving access to Commonwealth facilities. It could be measured by the estimated increase in visitor days per year, for example.

The *improved land use benefit* of Table 4-1 was included to reflect the altered land uses expected to result from modifications in the transportation network. It could be measured by the number of acres shifted from one category of use, such as residential land use, to another category, such as industrial and commercial land use.

The benefit of *enhanced social values* given in Table 4-1 was intended to subsume all the social goals given in Table 2-1 and was considered to involve both subjective judged factors, such as the amount of aesthetic enhancement achieved by a particular project, and objectively measureable factors as changes in air pollution and noise levels.

Obviously, some of the benefits given in Table 4-1 could be expressed in quantitative terms such as the *amount* of increased capacity, the *amount* of decreased travel time, the *amount* of cost savings and/or the *amount* of available excess capacity utilized, the *amount* of additional employment generated per industry group, and the *type* and *amount* of anticipated land use change, and the *number* of additional tourist days anticipated. However, other benefits which embody definitely non-quantifiable values like comfort and convenience are clearly only subjective judgments.

4-3 Project Benefit Ranking

The relative ranking of the nine benefits anticipated from each project was accomplished by a committee of technical experts. The mechanics of the procedure involved assigning a number to each benefit for each project; an arbitrary numerical scale from -5 to +5 was used in which +5 was defined to represent 100% or greater improvement, +4 represented a 50-99% improvement, +3 represented a 25-49% improvement, +2 represented a 10-24% improvement, and +1 represented a 5-9% improvement, and 0 represented insignificant improvement (less than 4%), with the negatives representing similar amounts of disbenefit.* However, the choice of the scale used was immaterial so long as the degree of achievement of each benefit for each project relative to all the other benefits of that project could be conveniently represented.

4-4 Normalization of Benefit Ratings

The benefit ratings assigned in Step 2 were normalized in terms of the percentage of the state population anticipated to receive them. This was necessary so that two projects with equal benefit ratings were not weighed equally when one was of Statewide impact and the other of local interest only. Clearly, other normalizations, reflecting the number of different interest groups affected by a given project and scaled to reflect their relative importance might have been of greater interest, but such refinement would attach more precision to the benefit estimates than is meaningful.

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* It was assumed that on those separately numbered projects involving both study and implementation that the benefit rankings apply to both pending completion of the feasibility studies. Different benefit rankings may, of course, be assigned to a project based on the results of the feasibility study. However, this cannot be done prior to completion of the feasibility studies.

4-5 Estimation of the Anticipated Project Costs

If infinite amounts of money were available to PennDOT to spend on transportation projects, then all the transportation planning goals could be satisfied and discrimination among projects would be unnecessary. However, PennDOT will have to operate within the confines of a limited budget and hence project costs had to be included as an element in the evaluation. The relevant costs were the out-of-pocket investment costs to the Commonwealth, since it is these costs which will be charged against the PennDOT budget for new programs. The cost estimates and probable share of costs to be funded by the Commonwealth for each project were given in Table 3-1. Use of these estimates in the evaluation involved taking the midpoint where a cost range was shown or the probable cost where it was known and then multiplying the appropriate cost by the percentage to be funded by the State. For each separately numbered project which required a feasibility study prior to consideration for implementation only the out-of-pocket study cost to the State was included in the evaluation process.

4-6 Ranking of Transportation Goals

As mentioned in the introduction to this section, the most crucial aspects of the evaluation of alternative projects involves ranking, relatively, the goals of transportation planning. To circumvent the difficulties involved in basing a master plan on such completely subjective and arbitrary choices, the approach followed was to weight the goals arbitrarily and examine the sensitivity of the project selection to the alternative weightings. Three overall development goals were, therefore, emphasized in the evaluation:

1. Improvements in Transportation Service;
2. Economic Development;
3. Social Development---"Making Pennsylvania a Better Place to Live".

The individual benefit rankings used for each overall goal are given in Table 4-2. Alternative goal weightings could, of course, be employed. Indeed the development of a means for establishing a consensus of goals is a political task of the first magnitude for both PennDOT and the State government.

TABLE 4-2

ALTERNATIVE GOAL RANKINGS USED IN PROJECT EVALUATION

Benefits	*BENEFIT RANKING* FOR* Improvements in Transportation Service	Economic Development	Social Development
Increased Capacity	100	10	20
Increased Travel Speed	100	20	10
Improved Safety	20	10	20
Improved Comfort and Convenience	100	20	50
Cost Savings and Efficiency	20	50	10
Enhanced Economic Development	20	100	10
Increased Tourism and Recreation	10	50	100
Improved Land Use	20	100	20
Enhanced Social Values	10	10	100

*Again, it must be pointed out tha the choice of a ranking scale of 0 to 100 in this illustration is immaterial so long as the value attached to each goal relative to all other goals can be conveniently represented.

4-7 Determination of Probable PennDOT Budgets for New Projects

Since the determination of the budget which PennDOT should receive for new projects will be very much related to the projects for which expenditures are proposed, it was necessary to examine the sensitivity of project selection to the assumed budget. As it turned out, only two budgets appeared to be of interest. It was decided that the first and probable PennDOT budget for new projects was simply the existing state-funded new project budget for the Pennsylvania Department of Highways, estimated to be approximately $300 million per year or $2.0 billion in the period through 1975 covered by this plan.* The other budget of interest was defined to be the amount required to study or implement all of the separately numbered projects that were mutually exclusive; this amounted to $4.9 billion.

4-8 Benefit Cost Calculations

The usual procedure in the benefit-cost approach to project evaluation is to place the benefits and costs on some commensurate scale. The most popular approach to this scaling problem has been to use the dollar as the scaling unit. For example, in transportation planning, values are often assigned to travel times and accident rates so that these benefits can be combined algebraically with costs. Then projects are ranked on the basis of some measure of total minimum transportation cost. While this approach is very convenient, it is clearly inadequate for assessing the many important qualitative benefits of transportation programs. Thus, it was necessary to adopt some other evaluation technique. We have employed for this purpose a computerized resource allocation model developed by the Franklin Institute Research Laboratories specifically for evaluating subjectively determined program benefits in the light of a set of weighted goals subject to overall cost constraints.†

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*It is recognized that at the present time the highway budget cannot be used for other than highway purposes.

†This tool was originally developed to assess cultural exchange programs for the U.S. Department of State. It uses a simplified linear programming technique and is described in the Franklin Institute Research Laboratories Technical Report 1-187, *An Operations Research Model for Program Evaluation*, prepared for the Center for International Systems Operations and the Bureau of Educational and Cultural Affairs of the U.S. Department of State, April 1967.

Basically, this model selects that combination of projects which will maximize the procurement of benefits given specified project costs and a budget level which is to be spent but not exceeded.

The model can be exercised in either of two modes. One mode assumes that the procurement of additional amounts of a given benefit is of decreasing marginal utility; the other mode assumes that procurement of additional amounts of a given benefit is equally as valuable as the original procurement of that benefit. Both modes were used in this evaluation as another test of the sensitivity of project of outcome.

The inputs to the model are the elements of information derived in the previously described steps of the evaluation. Forms similar to that shown in Table 4-3 were completed for each project, based on the decisions described above. This information was next transferred to punch cards along with descriptions of the relative goal rankings and the budget levels to be tested. The resource allocation model was then exercised using an electronic computer. The projects selected by this procedure for the Interim Master Plan are discussed in Section 5.

While the analysis and ranking of the projects using this technique provides some guidance for initial actions by a PennDOT, the important point is that this approach illustrates a methodology for evaluation which can be used until the more sophisticated methodology is available. Goals must be specified, in the interim, and the contributions of various projects to their achievement must be evaluated. Since so large an element of subjective judgment is now - and always will be - involved in assessing transportation benefits, it is important that participation by legislators, governmental executives, officials of private enterprises, and public interest groups be solicited in the evaluation process. In this context, there are two distinct problems: weighting benefits and ranking goals.

Table 4-3

COST AND BENEFIT DATA FOR PROJECT EVALUATION

Illustration

EVALUATION ELEMENT PROJECT	Investment Cost to State (thousands of dollars)	Increased capacity (throughput)	Increased speed (time saving)	Cost saving and efficiency	Economic development	Improved safety	Comfort and convenience	Increased tourism & recreation	Improved land use	Social improvements	Normalizing Factor
PROJECT X	413	3	2	0	0	0	1	0	0	-1	.36
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While many benefits are quantifiable and thus can be evaluated with precision by technical experts, the evaluation of qualitative social benefits is clearly a political problem. As such, it cannot be resolved solely by technicians or even by deference to the opinions of decision-makers. The determination of transportation goals- involving as it does the basic values of our society, and the ranking of these goals is likewise a political problem, solvable only through the political process.

No one group is competent to decide which goals should dominate Pennsylvania's development or to assess the qualitative benefits of implementing alternative programs. These matters must be resolved through the political process of free, democratic debate. The recommendations of this Interim Master Plan given in the next section of this report must, therefore, be accepted with the recognition that they are based only on the evaluation of a few selected experts using their arbitrary sets of goal weightings. These plans must also be evaluated in the forum of public opinion by the citizens of the Commonwealth whose economic, social, and cultural activities will be served through improved transportation.

SECTION 5
RECOMMENDED INTERIM MASTER PLAN FOR TRANSPORTATION DEVELOPMENT

5-1 INTRODUCTION

The results of the benefit-cost evaluations are given in Table 5-1 which lists the projects recommended in the Interim Master Plan. Those projects which were selected under all assumptions about goal values and all budget levels were clearly preferred and hence are included "Highest Priority Projects" in the recommended plan. Those projects that were selected under some goal-value and budget combinations, but not under others, are defined as "Second Highest Priority Projects"; their execution depends on the relative goal values which the Commonwealth wishes to emphasize and the funds which it wishes to make available to PennDOT. Those projects which were rarely or never selected are included under "Lowest Priority Projects".*

Assuming that PennDOT will be able to continue spending at the current level of the Pennsylvania Department of Highways, approximately $2.0 billion in State funds will be available for new projects in the period to 1975. This will permit the purchase of feasibility studies or implementation where no feasibility studies are required for all 14 projects in the Highest Priority category and 58 projects in the Second Highest Priority category. Hence, the 72 projects in these two categories comprise the recommended Interim Master Plan for Transportation in Pennsylvania to 1975. This Plan is estimated to cost approximately $1.9 billion to the State and $4.1 billion on an overall basis. This does not include the estimated costs for implementing those projects which require prior feasibility studies. Assuming that each of the projects studied will be found worthy of implementation, it is estimated that an additional $5.0 billion in State funds and $7.2 billion in total (State plus federal

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*The priority for implementation of those projects which require a feasibility study is assumed to be the same as the feasibility study. This, of course, is subject to change based on the results of the feasibility study.

Table 5-1

RECOMMENDED PROJECT PRIORITIES FOR INTERIM MASTER PLAN

1. Highest Priority Projects for PennDOT**

PROJECT NO.	DESCRIPTION	PROJECT COST TO STATE (THOUSAND DOLLARS)				TOTAL PROJECT COST (THOUSAND DOLLARS)			
		Study	Implementation	Total	Implementation Costs for Studies	Study	Implementation	Total	Implementation Costs for Studies
U-4	Demonstrate Electric Cars		510	510			3,000	3,000	
U-7	Subsidize Commuter Transportation (S)	75		75	35,000	75		75	35,000
U-12	Investigate Alternative Methods of Urban Transit (S)	550		550	51,000	550		550	300,000
U-13	Sponsor Jitney Service (S)	35		35	510	35		35	3,000
H-2	Complete Major Highway Improvements		750,000	750,000			1,500,000	1,500,000	
H-7	Erie-Philadelphia Highway (S)	150		150	150,000	150		150	300,000
A-1	Promote International Flights at Pittsburgh (S)	75		75	6,250	75		75	12,500
A-2	Heliports and STOL Airports in Urban Areas (S)	150		150	150,000	150		150	300,000
A-6	Upgrade General Aviation Facilities (S)	150		150	37,500	150		150	75,000
T-1	Construct Roads - Tocks Island		22,300	22,300			44,600	44,600	
T-2	Construct Access Roads to Primitive Areas		6,250	6,250			12,500	12,500	
T-3	Construct Scenic Parkways		150,000	150,000			300,000	300,000	
G-1	New City Transportation (S)	75		75	750,000	75		75	1,500,000
L-3	Change General Order 29 (S)	15		15	75	15		15	75
TOTAL		1,275	929,060	930,355	1,180,335	1,275	1,860,100	1,861,375	2,525,575
2. Second Highest Priority Projects for PennDOT**									
R-1 to R-11	Keystone Corridor (S)	300		300	3,000,000†	300		300	3,000,000†
R-12	Upgrade Rails and Equipment - Harrisburg to Philadelphia (S)	150		150	143,000	150		150	143,000
R-13 to R-16	Improve Harrisburg Terminal (S)	150		150	2,125†	150		150	12,500†
R-17	Improve Selected Rail Stations		32	32			190	190	
R-18	Intermodal Freight Terminal at Philadelphia (S)	75		75	17,500	75		75	35,000
R-19	Intermodal Freight Terminal at Pittsburgh (S)	75		75	17,500	75		75	35,000
R-20	Intermodal Freight Terminal at Harrisburg (S)	75		75	6,250	75		75	12,500
R-21	Intermodal Freight Terminal at Wilkes Barre-Scranton (S)	75		75	6,250	75		75	12,500

See footnotes on last page of Table.

2. Second Highest Priority Projects for PennDOT (Continued)

R-22	Intermodal Freight Terminal at Erie (S)	75		75	6,250	75		75	12,500
R-23	Grade Crossing Elimination (S)	35		35	150,000	35		35	300,000
U-1	Hovercraft on Rivers (S)	75		75	510	75		75	3,000
U-2	Build Rail Link between Terminals - Philadelphia		8,500	8,500			50,000	50,000	
U-6	Aerial Tramway at Pittsburgh (S)	150		150	2,125	150		150	12,500
U-8	Help Buy 275 Buses - Pittsburgh		272	272			1,600	1,600	
U-9	Help Buy 300 Buses - Philadelphia		298	298			1,750	1,750	
U-10	Help Buy Buses - Other Cities		145	145			850	850	
U-11	Help Buy 60 Rail Cars - Philadelphia Commuter Service		2,754	2,754			16,200	16,200	
U-14	Railroad Right-of-Way Availability - Philadelphia and Pittsburgh (S)	300		300	51,000	300		300	300,000
U-15	Philadelphia Subway Extension		20,667	20,667			124,000	124,000	
U-16	Extend Hatboro Line		2,125	2,125			12,500	12,500	
U-18	Controversial Freeways (S)	850		850	117,750	850		850	235,500
U-19	Liberty Tubes - Pittsburgh (S)	75		75	2,125	75		75	12,500
U-20 to U-21	Skybus Study and Demonstration - Pittsburgh	75	17,000	17,075		75	100,000	100,075	
U-25	Construct 50,000 Parking Spaces, Ends of Transit Lines		17,000	17,000			100,000	100,000	
H-1	Complete Second Six-Year Highway Program		850,000*	850,000*			1,700,000*	1,700,000*	
H-4	Improve 224 Accident Locations		7,000	7,000			14,000	14,000	
H-5	Improve 614 Hazardous Locations on School Bus Routes		25,750	25,750			51,500	51,500	
H-6	Improve 452 Hazardous Locations		22,650	22,650			45,300	45,300	
I-1	Emergency Fund - Department of Commerce		3,000	3,000			3,000	3,000	
I-3	Container Terminal at Chester (S)	75		75	17,500	75		75	35,000
I-4	Philadelphia - Baltimore Barge Service (S)	75		75	6,250	75		75	12,500
I-6	Pennsylvania Land Bridge (S)	150		150	6,250	150		150	12,500
I-9	Establish Foreign Trade Zones in Pennsylvania (S)	75		75	35,000	75		75	35,000
I-10	Survey and Enlarge Clearances (S)	300		300	150,000	300		300	300,000
A-3	Pittsburgh Airport Access (S)	75		75	12,750	75		75	75,000
A-4	Construct Rail Transportation to Philadelphia Airport		3,400	3,400			20,000	20,000	
A-5	Upgrade Airport Terminal Facilities (S)	150		150	17,500	150		150	35,000

See footnotes on last page of Table.

2. Second Highest Priority Projects for PennDOT (Continued)

A-7	Reduce Airspace Congestion - Philadelphia and Pittsburgh (S)	75		75	17,500	75		75	35,000
G-2	Emergency Fund - State Planning Board		300	300			300	300	
W-1	Disposal of Dredgings from Pennsylvania Waterways (S)	75		75	6,250	75		75	12,500
W-2	Waste Pipelines (S)	150		150	17,500	150		150	35,000
W-3	Backhauling of Garbage and Trash (S)	150		150	1,500	150		150	3,000
L-1	Allow Multiple Bottom Trailers on Pennsylvania Highways (S)	150		150	300	150		150	300
L-8	Amend Constitution to Allow Pledging of State Credit (S)	35		35	150	35		35	150
TOTAL		4,070	980,893	984,963	3,810,835	4,070	2,241,190	2,245,260	4,717,450
TOTAL	Highest Priority and Second Highest Priority Projects	5,345	1,909,953	1,915,298	4,991,170	5,345	4,101,290	4,106,635	7,243,025
3. Lowest Priority Projects for PennDOT**									
R-24	Straighten Track at Philadelphia		5,950	5,950			35,000	35,000	
U-3	Build Underground Conveyor in Center City Philadelphia		2,125	2,125			12,500	12,500	
U-5	Rail Bus Demonstration		145	145			850	850	
U-17	Purchase "Skycrane" Helicopter		850	850			5,000	5,000	
U-22	Construct 2000 Parking Spaces - Philadelphia		1,700	1,700			10,000	10,000	
U-23	Construct 2000 Parking Spaces - Pittsburgh		1,700	1,700			10,000	10,000	
U-24	Construct 4000 Parking Spaces - Other Cities		2,550	2,550			15,000	15,000	
U-26	Sponsor Helicopter Rescue Service		1,500	1,500			3,000	3,000	
U-27	Exclusive Bus Lanes (S)	150		150	150,000	150		150	300,000
H-3	Release Some State Roads to Local Government(S)	35		35	300	35		35	300
H-8	Demonstrate Electronic Merge Signals		275	275			550	550	
H-9	Demonstrate Truck Weighing Devices		275	275			550	550	
I-2	Improve General Cargo Facilities - Port of Philadelphia		1,500	1,500			3,000	3,000	
I-5	Improve Coal Loading Facilities - Port of Philadelphia		1,500	1,500			3,000	3,000	
I-7	Construct Lake Erie-Ohio River Canal		106,000	106,000			1,060,000	1,060,000	
I-8	Deepen Delaware River Channel (S)	75		75	300,000	75		75	3,000,000

See footnotes on last page of Table.

3. Lowest Priority Projects for PennDOT (Continued)

L-2	Investigate Role of PennDOT in Assisting PUC/ICC (S)	35		35	150	35		35	150
L-4	Investigate Hazardous Material Movements (S)	75		75	17,500	75		75	35,000
L-5	Investigate Use of Electronic Law Enforcement Aids (S)	300		300	6,250	300		300	12,500
L-6	Reduce Air Pollution (S)	75		75	37,500	75		75	75,000
L-7	Reduce Vehicular Noise (S)	75		75	17,500	75		75	35,000
TOTAL		820	126,070	126,890	529,200	820	1,158,450	1,159,270	3,457,950
TOTAL	All Projects	6,165	2,036,023	2,042,188	5,520,370	6,165	5,259,740	5,265,905	10,700,975

†Maximum Cost for Mutually Exclusive Projects

*Since some elements of the Six-Year Highway Program will be completed under Project H-1, listed in the "Highest Priority Projects," only the cost of the remainder of the Six-Year Program is included here.

**Order of projects within each priority group is arbitrary and has no significance.

(S)Only study of these projects is recommended for Interim Master Plan; however, estimated implementation costs are shown to indicate possible funding requirements.

and local) funds will be required to implement these projects. Thus, the total out-of-pocket investment cost for studying and implementing all 72 projects included in the Interim Master Plan is estimated to be \$11.3 billion of which the Commonwealth's share amounts to \$6.9 billion.

5-2 Highway Transport Projects

The Interim Master Plan, simply stated, consists of completing by 1975, all highway construction shown in the Second Six-Year Highway Improvement Program and initiation or completion of certain other transportation projects associated with improvement of the quality of life and opening of new economic opportunities for the residents of the Commonwealth.

Even though the completion of all elements of the Second Six-Year Highway Improvement Program (H-1) and (H-4 to H-6) did not rate the highest priority, it is included in its entirety in the plan. Early completion of the road building program already underway will provide some of the much needed capacity (H-2) to keep passengers and freight moving in the Commonwealth. Table C-1a (Appendix C) lists routes and locations which should be given special attention. A suggested follow-on to this highway program would be a Third Six-Year Program covering the period July 1969 to July 1975. A Third Six-Year Highway Program would cover the elements of this Interim Master Plan which are scheduled for this time period and incorporate ideas for projects which will grow out of PennDOT's own planning studies.

Certain highway-related projects recommended in the Interim Master Plan are not presently covered in the existing First or Second Six-Year Highway Improvement Programs. These include access roads to recreational land and primitive areas of the Commonwealth, scenic parkways and a diagonal high-speed highway between Erie and Philadelphia.

Even though Pennsylvania's highway network contains more mileage than that of all of her neighbors combined, there is still much to be done in providing better access to recreational lands and primitive areas in the Commonwealth. If Federal funds are released to the Corps of Engineers for completion of the Tocks Island Reservoir project in the late 1970's, the small rural roads of the area will require extensive upgrading. Also, new roads will be required. These improvements are recommended in the Interim Master Plan (T-1). Other developments in the State with great recreation potential which could be helped by improved access must also be aided by PennDOT. There are many lakes between Pittsburgh and Johnstown as far south as the Virginia-Maryland border which have great lakeside recreation potential if access from major highways were improved, and these improvements are also recommended (T-2). In addition, there is the biggest recreation development in the State at Kinzua Dam in McKean and Warren Counties. The Federal Government plans to continue upgrading the area and improving the Kinzua impoundment in the Allegheny National Forest through 1975. Officials have estimated that the Kinzua project could draw more than four million annual visitors by 1975 with proper access construction. Perhaps a good diagonal highway across the State could inspire more east-west travelers to stop in the Allegheny National Forest at Kinzua and at other recreational areas in the central part of the State and spend their tourist dollars where employment is badly needed. These and other benefits will be examined in the study of this highway (H-7). Additional tourist attraction to Pennsylvania will also result from the construction of scenic parkways in the central part of the State recommended in the Interim Master Plan (T-3).

An additional project recommended in the Interim Master Plan is a joint study sponsored by PennDOT and the Department of Commerce on the transportation infrastructure requirements for a new city. If such a city were located in the underdeveloped part of the State, it would also enhance economic and recreational development (G-1).

5-3 Air Transport Projects

While no aviation plan has ever been formulated for the Commonwealth, two airport plans which include Pennsylvania's airports have already been established by Federal Government agencies. Details of the plans of both agencies, the Federal Aviation Administration and the Appalachian Regional Commission, are given in Tables B-2 and B-3 of Appendix B. these plans are not in agreement either about approach or recommendations, PennDOT must conduct its own indpendent evaluation of the Commonwealth's airport requirements. As indicated in the background studies for this plan, the needs of Pennsylvania's 16 air-carrier airports will be adequately met by local planning in the period to 1975 with respect to the provision of plane-handling facilities. However, terminal improvements to facilitate passenger throughout with enhanced comfort and convenience may be required when the jumbo aircraft of the 1970 decade come into service, and the Master Plan calls for a study of airport terminal operations and requirements (A-5). In addition, a survey of general aviation airports and a study of their requirements is also recommended in the Interim Master Plan (A-6) along with a study of general aviation airport and air space congestion in the Philadelphia and Pittsburgh areas where problems currently exist (A-7). One interesting possibility to be examined in the general aviation survey and study is the development of industrial buildings and parks at airports in the Appalachian areas of Pennsylvania. This could offer fly-in access to managers who might otherwise by-pass plant location opportunities in isolated areas of the Commonwealth.

Another area of concern to overall Commonwealth aviation development is the provision of adequate airline services. The introduction of international flights at the Greater Pittsburgh Airport would give both of the Commonwealth's major aviation centers the full range of airline services. A study of the means of establishing this international service is therefore recommended in the Interim Master Plan (A-1).

Since the travel times to and from airports are taking up increasingly large percentages of the total trip time, forward-looking planning for aviation must seek to seek to solve the airport access problem. The full range of alternative solutions are therefore recommended for PennDOT consideration in the Interim Master Plan. One solution is the use of helicopters and short takeoff and landing (STOL) aircraft for short-haul air service from city center to city center, and a study of Pennsylvania's needs for these heliports and STOL airports is recommended in this Plan (A-2). Other solutions involve installing high speed rail links and transit systems, and studies of these requirements for these ground facilities to improve airport access in Philadelphia and Pittsburgh are also included in the Interim Master Plan (A-3 and A-4).

5-4 Urban Projects

Although local transportation planning will remain where it belongs--in local hands--a preponderance of PennDOT assistance should go to the cities of Pennsylvania, because more than three-quarters of the Commonwealth's residents live in metropolitan areas. Thus, PennDOT must assist Pennsylvania's urban area planners in determining which means of urban mass transit will be both beneficial and economically feasible (U-12). In addition, the difficulties experienced by private companies in maintaining commuter transportation services are of statewide concern. A possible solution recommended for PennDOT evaluation is the provision for State subsidies to guarantee a reasonable return-on-investment (U-7).

Other urban projects recommended in the Interim Master Plan are geared to the needs of specific cities. One project included in the Interim Master Plan for the Philadelphia and Pittsburgh areas includes a survey of abandoned or nearly abandoned rights-of-ways to provide increased commuter service between suburban areas and city centers (U-14) and construction of peripheral parking spaces at the ends of transit lines in order to encourage additional commuter mass transit (U-25). Other recommended projects aimed at improving the quality of urban life are studies of the economic feasibility, social impact, and alternative solutions to controversial freeways in metropolitan areas (U-18), the feasibility of waste pipelines to collect and carry industrial and untreated household waste to storage and land fill areas (W-2), and the backhauling of municipal garbage and trash in freight cars to strip mines (W-3).

The most significant planned transportation development in the Philadelphia area is the purchase of the largest privately owned municipal bus company in the United States, the Philadelphia Transportation Company (PTC) by the Southeastern Pennsylvania Transportation Authority (SEPTA). This should be a start toward initiating SEPTA's much-delayed program of unifying and coordinating public transportation service in a five-county region of Southeastern Pennsylvania. SEPTA is a child of state government in that is was formed by a special charter from the Commonwealth of Pennsylvania. It is recommended that PennDOT continue the support of SEPTA with the existing formula for matching funds for certain projects. Examples of such projects includes the rail link between the Pennsylvania Suburban and Reading Terminals (U-2), the Philadelphia Subway Extension (U-15). the purchase of Railcars (U-11) and of Buses (U-9), and the Extension of the Hatboro Commuter Line (U-16).

In some cases, it could be wise to finance an even greater portion of SEPTA's projects where the need is especially obvious. The railway transportation connection with Philadelphia International Airport (A-4) is an example of such a project. However, in providing transport between Center City and the Airport, it is highly recommended that boarding stops be planned for 30th Street Station (a principal stop on the Northeast Corridor) and an extensive parking area. With facilities for rail connections at 30th Street Station, trains could be used to move air passengers on the rails of the Northeast Corridor to alternate airports when the weather is unsuitable for flying at one airport but suitable at another. The large Civic Center parking lot on the existing rail line between the 30th Street Station and the vicinity of the Airport might be an ideal place for Airport users to leave their cars. The latter thought resulted from a recent survey which showed that Philadelphia International Airport users generally drive to the Airport and that very often they use the Schuylkill Expressway (which runs by the Civic Center) for at least one leg of the trip. A program should also be undertaken by PennDOT to demonstrate the use of electric cars to reduce congestion and air pollution in metropolitan areas (U-4). This program could be tied in with the proposed Bicentennial Celebration in Philadelphia.

The comments which apply to support of SEPTA also apply to the Allegheny Port Authority (PAT) at Pittsburgh. PAT needs new buses to replace trolleys and fully-depreciated, well-worn buses. PennDOT should continue the program of the Bureau of Community Development in providing partial financing of new bus purchases (U-8). The big issue, however is not buses but rapid transit. Pittsburgh undoubtedly is of such a size and population density that it needs rapid transit. The PAT recommended route from Bethel Park to Penn Central Park seems appropriate for the first "Skybus" rapid transit to be placed in commercial use at Pittsburgh (U-21). A PennDOT should financially support the first Skybus project, whether the route ends at Penn Central Park or several blocks short of the mark as some have suggested. In addition, PennDOT should make modified benefit-cost studies of the proposed downtown terminal locations for the Skybus (U-20). Furthermore, PennDOT should also undertake to determine the feasibility of relieving the congestion of the Liberty Tubes (U-19) and constructing an aerial tramway from the Golden Triangle to Duquesne Heights (U-6).

While newer and faster buses or rapid transit will provide obvious benefits to most residents of the Pittsburgh and Philadelphia Areas, as well as other metropolitan areas (U-10), the new hardware will mean little to one segment of the urban population, the residents of ghettos. Many ghetto residents are trapped at home after dark because they have no private automobiles. Taxi service is reluctant and infrequent in the ghettos and using available bus service is dangerous because of the walk to or from and the wait at a bus stop. Perhaps the personal service jitney offering doorstep pick-up and delivery and the security of a special policeman on-board could provide one answer to the ghetto's transportation problems. It would also provide employment for ghetto residents as drivers and special policemen and even provide a benign municipal presence which would aid in suppressing rising crime rates. Certainly, the idea of jitney service has enough merit to warrant PennDOT study (U-13).

New transportation-related activity planned for the Harrisburg area should, if possible, take advantage of the untapped assets which are offered at Olmsted State Airport. It will be advantageous, for example, to include the Airport in any railroad improvement plans financed by a PennDOT in the Harrisburg area. The proximity of the East Harrisburg Exit of the Pennsylvania Turnpike and the rails of the Main Line of the Penn Central to the existing temporary terminal at Olmsted suggests possibilities for building a new rail-air terminal there (R-16). However, the existing rail terminal is so close to State office buildings in downtown Harrisburg that its preservation may have some advantages from the standpoint of convenience (R-14 and R-15). The immediate need to build at least one new rail terminal and one new air terminal at Harrisburg is justification for sponsoring a study of the relative merits of all aspects of terminal locations and characteristics at Harrisburg as recommended in the Interim Master Plan (R-13). Such a study should include an analysis of possibilities for providing higher speed rail service out of Harrisburg for east-west travelers who wish to visit in Megalopolis but do not wish to drive their cars on its congested highways and streets. The planned tie-in of the Harrisburg-Philadelphia rails with the Northeast Corridor rails at Philadelphia could offer the traveler a painless, fast ride through the urban sprawl. It is also recommended that improvements be made at the Paoli, Downingtown, Coatesville, Lancaster, and Elizabethtown Stations in order to upgrade service and enhance comfort and convenience (R-17).

While the prospects for using existing rail right-of-way look bright for Harrisburg-Philadelphia service, a PennDOT administration should not be too eager to finance upgrading of the rails without prior study of the requirements (R-12). Furthermore, the great expense of making either major or minor improvements to the rails does not offer time savings, comparable to those obtainable from terminal improvements.

While the potential for imaginative use of Olmsted State Airport to provide new passenger service is intriguing, this should not overshadow possibilities for transportation-related economic development at the same location. The airport has great potential for rail-air-truck intermodal transfer which could offer many advantages both to shippers and transportation companies. The feasibility of building an efficient intermodal freight forwarding terminal at Olmsted should be investigated if the study which is already underway does not deal with the matter definitively (R-20).

Another interesting possibility for the Olmsted property is the establishment of a foreign trade sub-zone where foreign commodities could be processed or stored duty-free under certain conditions. While the concept of foreign trade zones is not new, the concept of sub-zones is relatively recent. The New Orleans Foreign Trade Zone will be only the second in the United States to add a sub-zone if the petition now before the Foregin Trade Zone Board is accepted. Conceptually, the Olmsted Foreign Trade Zone would be tied in by rail and highway to similar zones at Pittsburgh and Philadelphia, for example. Pittsburgh's zone might be in open space near railroad tracks and a turn-off from the Pennsylvania Turnpike. An ideal location for a Foreign Trade Zone at Philadelphia might be on the Chester side of International Airport, where a new air-cargo terminal will be built soon and where open land and railroad tracks are already available. The completion of the Cross County Expressway, Route 476, to the Airport from the Turnpike also enhances the Airport Area's attractiveness for such a Foreign Trade Zone and perhaps an Intermodal Freight Forwarding Terminal (IFFT). The modes which could be accommodated by the IFFT near the Airport would include waterborne transportation, since the Delaware River shipping channel runs by the proposed location. These possibilities will be studied in the projects recommended in the Interim Master Plan (I-9 and R-18). Similar studies for an Intermodal Freight Forwarding Terminal should be undertaken for Pittsburgh (R-19), Wilkes-Barre-Scranton (R-21), and Erie (R-22).

A likely location in Chester for a container port development has been the subject of much disharmony between the Philadelphia Port Corporation (PPC) and the Delaware River Port Authority (DRPA). It was beyond the scope of the Interim Master Plan to delve into the question of proper port development, but a PennDOT administration should place in high priority on a thorough study of the merits of such a container terminal (I-3).

5-5 Rail Transport Projects

All of the rail improvements pertaining largely to commuter transportation recommended in the Interim Master Plan have been described under Urban Projects. However, in addition to these projects it is recommended that a feasibility study be undertaken of alternative Keystone Corridor concepts in terms of demand, economic viability, preferred route, and configuration (R-11). Purchase of the right-of-way for the Keystone Corridor and construction of new or upgrading of existing railroad tracks should be deferred until such a feasibility study is completed (R-1 to R-10).

It is also recommended that a study be conducted of railroad grade crossing in order to reduce safety hazards and accidents (R-23). A study should also be initiated to determine the feasibility and benefits of a Pennsylvania Land-Bridge between the Ohio and Delaware River (I-6). This could facilitate movement of materials between barge and rail, barge and truck, and barge and pipeline, especially between gulf coast plants and east coast plants with transfer in Pittsburgh.

5-6 Water Transport Projects

Since Baltimore is often a last stop for general cargo ships, sending cargo to Baltimore by barge for combination with shipments originating there might provide Philadelphia manufacturers with better and faster service, especially on international shipments. A study should therefore be undertaken to determine the feasibility of barging general cargo in containers from Philadelphia to Baltimore as recommended in the Interim Master Plan (I-4).

It is also recommended that a study be undertaken of alternative means for disposing of dredgings from the Delaware River (W-1). The Corps of Engineers has been greatly hampered in efforts to acquire land for this purpose. Solutions of this problem of disposing of dredgings is vital in order to assure that the Delaware River Channel can be maintained at its current depth.

5-7 Projects Related to Administration, Legislation, and Regulation

There are many possibilities for PennDOT actions which would cost very little, but which could have great impact on the Commonwealth (with good and bad results). Such projects often fall under the heading of Administration, Legislation, and Regulation. Because of their low-cost characteristics and the nebulous nature of the anticipated benefits, these projects are difficult to evaluate. However, all projects and programs in this category were considered on the same scale for evaluation with other proposed projects and programs. The result was the selection of many of these projects primarily because they are very low-cost studies.

Recommended for inclusion in the Interim Master Plan is a study to develop plans for changing General Order 29 of the PUC so that interline arrangements among motor carriers will be allowable (L-3). Similarly, a study of the impact of allowing multiple-bottom truck trailers on Pennsylvania highways was also included, aimed at changing the current state law prohibiting these trailers (L-1).

Removal of these restrictions is very much favored by the trucking industry in the Commonwealth, and hence PennDOT must inform itself of the merits of the issues.

A third recommended study of this type will address the problems of amending Pennsylvania's Constitution so that PennDOT can pledge the credit of the Commonwealth to support worthwhile transportation projects of private enterprise (L-8). There are many advantages and disadvantages in so doing which must be objectively assessed.

A fourth recommended study will survey the clearances of existing tunnels, bridges, underpasses, and pipelines and study the requirements and define the regulatory revisions necessary to insure that the largest foreseeable vehicles will clear these obstructions (I-10).

Finally, it is recommended that two Emergency Funds be established for the State Department of Commerce and the State Planning Board, respectively (I-1 and G-2). The fund for the Department of Commerce would be used to build short access roads to prospective plant locations to stimulate industrial development, and the State Planning Board fund would be used to obtain urgently needed assistance on transportation planning problems.

5-8 Management Information System for PennDOT

It is essential to a newly established Pennsylvania Department of Transportation to make careful provisions for securing and maintaining information concerning the present research, analyses, and findings in all areas relevant to transportation planning. This requires a massive data collection effort initially and sufficient staffing to monitor and update this data on a continued basis. Currently the problems of data collection and collation for transportation planning are accute. Some kinds of data are abundant but are often incompatible and only rarely addressed to questions of importance for comprehensive planning. Reliable statistics on the movement of people and goods by all modes showing time trends, cause and effect relationships, and by length, purpose, and elapsed time of trip simply do not exist. Furthermore, there is little accurate data by which true costs can be ascertained and analyzed with assurance.

This lack of adequate information undermines the basis for informed transporation planning. At present, transportation research must either expend much of its effort on data collection and/or make questionable assumptions and generalizations in order to proceed with analytical methods. In this way, new data is either not collected or collected to serve the immediate needs of a particular survey, and, in either case, the foundations for analysis remain undeveloped and unvalidated.

Failure to provide adequately for a centralized data bank properly situated within the PennDOT organization will ultimately cause small data banks, poorly organized and designed to meet particular expedient needs rather than long term goals and objectives, to grow in individual sections. These data banks will duplicate efforts in the expenditure of both money and man-power and result in a much less effective management tool.

A tentative design for a management information system is given in Appendix G. It is designed to accomodate the most general type of transportation data as well as very detailed specialized analyses. Flexibility is essential, and the proposed system is structured to allow for both growth and change and is in no way bound to the depth and breadth of data currently available. At its best, however, this design should be considered developmental, and any final plans for implementation of an information system should result only after a much more detailed and structured analysis of data requirements and availability has been conducted by the new Department. Although not included in the plan we recommed implementation of a management information system as an essential basic function for PennDOT.

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PRELIMINARY ANALYSES OF NEEDS AND PROJECTS FOR AN INTERIM TRANSPORTATION MASTER PLAN IN PENNSYLVANIA TO 1975

Appendix Volume

prepared for

The Governor's Committee for Transportation
Commonwealth of Pennsylvania

Technical Advisory Committee Operational Project 6a

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PRELIMINARY ANALYSES OF NEEDS AND PROJECTS FOR AN INTERIM TRANSPORTATION MASTER PLAN IN PENNSYLVANIA TO 1975

Appendix Volume

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August 5, 1968

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Commonwealth of Pennsylvania

Technical Advisory Committee Operational Project 6a

THE FRANKLIN INSTITUTE RESEARCH LABORATORIES
SYSTEMS SCIENCE DEPARTMENT

NOTICE

The opinions, findings and recommendations expressed in this report are the authors' and do not necessarily reflect those of the Governor's Committee for Transportation.

FOREWORD

The Interim Master Plan for Transportation described in this report was prepared by the Systems Science Department of The Franklin Institute Research Laboratories for the Governor's Committee for Transportation, Commonwealth of Pennsylvania in response to Technical Advisory Committee Operational Project 6a. The study was conducted under the direction of Dr. Thomas E. Stelson, Director of Project for the Governor's Committee for Transportation with the assistance of the Technical Advisory Committee to the Governor's Committee.

Overall direction of this study was provided by Mr. Joel N. Bloom, Technical Director of the Systems Science Department. Mr. Arno Cassel served as Program Manager and Mr. William R. Reeves as Project Leader for this study.

The Interim Master Plan presented in this report represents the culmination of three projects aimed at developing the first comprehensive master plan for transportation for the Commonwealth. It sought to identify projects and programs which would best serve Pennsylvania's transportation planning goals in the period through 1975. The report consists of two separately bound volumes.

Volume 1, the main body of the report, includes five sections. Section 1 discusses the rationale used in developing the plan. Section 2 reports on the statewide goals for transportation planning. Section 3 concerns the identification of alternative projects and programs to achieve the goals. Section 4 discusses the evaluation of the alternatives projects and programs in terms of their anticipated costs and benefits. Section 5 describes the results of the evaluation and reports on the projects selected for inclusion in the Interim Master Plan.

The appendix volume contains eight appendices. Appendix A is a state-of-the-art review of transportation technology and assesses the input of technical change on transportation in Pennsylvania. Appendix B describes those Federal funding programs which may be of significance to PennDOT. Appendix C describes existing transportation related plans and programs of State and local government agencies for the thirteen planning regions. Appendix D reviews transportation related plans and programs of private companies. Appendix E is a review of demographic trends in Pennsylvania in terms of the economic and social forces affecting each of the 13 regions in the State. Appendix F describes those sections of the State Constitution pertinent to transportation financing, control, and improvement. Appendix G contains a suggested automated management information system to support PennDOT. Appendix H includes some elements of the evaluation of projects and programs for the Interim Master Plan and detailed evaluations of four projects.

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APPENDIX A

IMPACT OF NEW TECHNOLOGY ON TRANSPORTATION IN PENNSYLVANIA

INTRODUCTION

Even the most routine functions of a DOT can obviously be carried on more efficiently if the future nature of these functions is envisaged and understood some time before the need for changing the routine arises. Given such prevision, future functions can be planned for more intelligently and provision made for a smoother transition from old to new. The need to adapt to new situations is profoundly affected by technological change, including in this term changes brought about by computerization, automation, and application of systems analysis. Long hailed and widely accepted as bringing vast benefits to the populations of the industrialized nations, there is no doubt that in detail--and at the point of impact--technological change can and does create problems.

In assessing the manner in which technological change can be handled, it should be noted that the for the past two hundred years the specific effects of technological change had been viewed as unforeseeable and hence impossible to plan for. In recent years the outlook has changed: first, technological change has been viewed as an event or series of events which can be induced; i.e., given sufficient human and material resources and given a realistic appraisal of the current state of the art in a particular field, it becomes possible to achieve a desired breakthrough more or less on schedule. Second, technological change can, in the light of existing trends, be forecast fairly successfully, and development curves may be used to extrapolate the present into the future. Such extrapolations must take into account both the need for and the possibility of achieving that radical change in a particular activity which will make it possible to overcome the "saturation" effect, i.e., the tendency toward a reduced or even zero rate of expansion, in an older activity or industry which is based on "old" technology. A typical and obvious example of the above is the expansion in the range and volume of long-distance travel which first the train, then the gasoline engine, and now the jet engine, have in turn made possible. The importance of the above to the future functions of the Commonwealth of Pennsylvania DOT can be readily appreciated from the following considerations:

1. Forecasts of demands between specific transportation links imply certain future levels of economic activity at each terminus (node) of the link. Such economic activity can be supported within a terminus only if (a) internal transportation problems are solvable; (b) the costs of transportation from a given node to other nodes are sufficiently low (for each of the nodes to be used) to make it feasible to carry the implied volume of transportation to and from the particular node; (c) intermodal coordination of transportation is possible to the necessary extent. Moreover, these forecasts will be reasonably accurate only if new technology does not quickly render obsolete the existing infrastructure nor the additions which are being planned; nor may it furnish a competitive advantage to other intrastate or interstate systems or nodes; and each individual node is capable of being integrated with an extensive transportation network, and its equipment is (in an economic sense) compatible with equipment used at more distant termini.

It therefore becomes important for the future Commonwealth of Pennsylvania DOT to (a) be as fully aware as possible of the implications of technological change with respect to demands for transportation and the capacity to supply that demand; and (b) plan ahead to at least soften the impact of technological advance upon the existing transportation systems and organizations but preferably to utilize information on new technology to improve the position of Pennsylvania's transportation system. It might be added that the various HUD and DOT demonstration projects are attempts to force technological change in transportation to (a) meet certain needs and goals deemed socially desirable; and (b) to accomplish the desired ends on a rational time schedule. This appendix is intended to convey, first, an indication of what technological changes in transportation are in the offing; second, to indicate their probable status in the near future; and third, to make specific recommendations in this general field.

PROBLEMS OF EXISTING TRANSPORTATION MODES AND SYSTEMS

I Problems in transportation which new technology is intended to solve may be briefly characterized as follows:

- A. Improvement in passenger and in freight throughput
- B. Reduction in bottlenecks:
    - 1. Between urban centers
    - 2. Within urban complexes
- C. Reduction in average origin-to-destination travel times
- D. Revitalization of economically weak segments of the transportation industry

If the examination of "new" technology that is conducted in the following pages is to serve the outlined goals, it will need to consider the purposes which these new developments are intended to serve, the modifications in existing systems to which they are likely to give rise, and the changes in costs and intermodal relationships which they are likely to bring about. For the purposes of this appendix, the "future" is defined as approximately 1975 and the years immediately following.

The word "new" includes ideas, concepts, techniques, and systems which at present are not in wide use. Thus some, like ground-effect machines, are (a) based on a principle that was well-known to the physicists of the 19th century and (b) in actual use in a small number of locations but not on a scale wide enough to make forecasts of their importance in Pennsylvania simple. Others, like the linear induction motor, which is likewise old in principle, are currently being studied for applicability to both conventional and new transportation systems, but there are no immediately firm plans for its introduction on a wide scale. Still others, like some version of the numerous systems designed to supply automobile drivers with audio or visual information aids, or the small electric automobile will definitely be in the picutre by 1975. Generally, it may be said that for our purposes the "newness" of proposed technological changes resides, not so much in the physical or electronic principles on which they are founded, but of these principles to the field of transportation.

An analysis of purposes which technological changes are intended to serve must be conducted on a number of different levels. One highly important purpose is of course to effect larger-scale movement of goods and persons in response to community economic needs; broadly speaking, the number of passenger-miles and the number of freight ton miles must be increased. In any particular application of technology, this type of improvement is, of course, stated specifically: e.g. to increase the number of passengers carried by the particular mode between sets of points at certain hours; to provide faster passenger service; to reduce waiting times between the moment that goods leave the distributor's plant and the time they arrive at their destination; to reduce the amount of freightcar or tractor-trailer time that is unproductive, etc. All such suggested improvements, though motivated by narrowly stated goals, have the effect of increasing the total capacity of transportation systems; i.e., their ability to move persons and goods. These increases at times act (and are indeed so intended) to intensify competition between the different modes for a share of a restricted market. At other times they act to provide needed additional capacity between several geographic points, or, in other words to eliminate, or at least to mitigate, the effects of existing bottlenecks between such points. Technological innovations thus may well act to encourage industrial growth, by making possible imports of goods from hitherto relatively inaccessible sources, and exports of goods to formerly relatively inaccessible markets. In addition, to the extent that transportation within a metropolitan complex is time-consuming, innovations may be proposed in response to the need to reduce travel and delivery times within the metropolitan area proper. As an urban complex grows in size, mass transit restricted right-of-way and street systems that once were adequate become overcrowded, and the need for additional capacity becomes an inhibiting factor on further growth. Thus the solution of mass transit problems becomes another fertile field for the introduction of new technology. In recent years the difficulty of providing access to and from airports, together with the need to expedite passenger and baggage handling at the airports, has created additional fields for the introduction of, or proposals for the introduction of new technology. The loss of railway freight business during periods when truckers side, airlines, and coal-slurry pipelines were increasing their share of the market eventually led the railroads to introduce new methods to recapture markets.* The inadequacy of traffic light systems particularly at rush hours, the growing number of highway accidents, the overcrowding of freeways, bridges and tunnels have all created the possibilities and needs for adoption of new techniques and new solutions.

In discussions of new technology, one important distinction (in practice it may be difficult to draw a line) is between piecemeal innovations, which affect only a constituent part of a transportation system or mode, and a broad-scale innovation, which affects an entire system. In addition there are systems-oriented approaches, such as the transgrid system, which in the first instance propose a concept that embodies a geographic layout from which there may or may not stem a need for new technological solutions. The discussion in the following pages is arranged so as to range over the various topics raised in The Introduction.

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*One such method, the unit train (discussed subsequently) was originally intended to keep coal-hauling business which was in danger of being lost to the coal-slurry pipelines.

PROPOSED SOLUTIONS

A. The Railroads (intercity travel)

There has been much discussion over definitions of the term intercity. No attempt will be made here to add to such discussions, and the definition used will be purely operational and necessarily crude: Railroad routes over which a cruising speed in excess of 100 miles per hour can effect appreciable savings in passenger travel time, qualify here.

A number of important and at least partly successful attempts have been and currently are being made to increase cruising speeds to levels that will result in average train speeds of approximately 80 to 100 miles per hour; which, (depending on the number of stops) implies cruising speeds of the order of 120-150 mph. These systems operate on conventional roadbeds and tracks, with modifications to be discussed subsequently.

Vehicles. Because such systems require high power-to-weight ratios, much effort has been devoted to increasing that ratio through increases in power, reductions in weight, or both. Currently in operation or under consideration are the following:

The New Tokaido Line (NTL) - This line operates on new (U.S. standard gauge) track between Osaka and Tokyo. Its multiple unit electric trains operate at 25kV, each unit be equipped with four 228-hp motors. Despite the high speeds, approximately 125-135 mph, the cars are not as light in weight (approximately 1450 lbs per passenger) as are the prototype cars being readied by United Aircraft (1300 lbs per passenger, design weight) for the Northeast Corridor Demonstration Project, but yet are far lighter than a conventional train which, with Diesel locomotives, parlor cars, and dining car, can average a high as 4000 lbs per passenger. In terms of horsepower per ton, these cars average about 15 hp per ton as compared to roughly two--thirds that figure for a Diesel locomotive alone. The rails on which the Tokaido line operates are butt-welded. They weigh 110 pounds per yard as compared to the 140-pound rail installed on the experimental New Brunswick-Trenton track on which the new Budd-manufactured PCR* trains are being tested. The trains feature automatic train control for braking down to 19 mph, at which point the motorman can apply brakes mechanically to bring the train to a full stop. Centralized train control from Tokyo is also used on the system.

Technical Feasibility: The successful operation of the line for several years is ample proof of the technical feasibility of the Japanese line. From discussions with knowledgeable persons it appears that among the problems have been high track maintenance costs which, because they reflect a need to examine and repair track during night hours, have made it impossible to run the hoped for fast night-time freight trains on the same track. The matter of passenger comfort--an important one form the point of view of the volume of passenger traffic which a railroad can hope to attract--has generally been commented upon favorably.

Economic Aspects: The NTL has proven extremely popular. It has increased the ratio of railway passenger traffic to airline passenger traffic in that corridor. This development would however seem to be the result of the fact that, prior to its construction, both the railroads and the airlines were incapable of meeting the demonstrably present need for additional transportation in that corridor. Thus the change in the railroad/airline ratio in favor of the railroad is a reflection almost entirely of the fact that the railroad capacity was increased.

The French 207 mph Locomotive Train - In 1955 the (SNCF)# demonstrated that two of their standard locomotives, (the CC 7107 and the BB 9004), modified by a change of

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*Penn Central Railroad
#Societe Nationale des Chemins de Fer

gear ratios, installation of special pantographs, and a certain amount of streamlining, could be operated on their standard (but carefully improved) track at 207 mph. There were two such runs, one with each engine, in which the locomotive pulled three passenger cars on a 29-mile stretch of almost straight road between Lamothe and Monceux. Despite various technical problems discussed below, the feasibility of a locomotive-drawn 200-mph train had been demonstrated in principle.

Technical Feasibility: The test runs revealed a number of technical problems: The specially designed pantographs were incapable of operating for even these relatively brief periods without burning out; sparking occurred between the wheels and the track; some transverse oscillations had occurred in one locomotive, with resultant damage to the track; one of the gear trains showed signs of wear. On the other hand, train stability was generally described as excellent. Judging from the reports on the trial run there would appear to be no obviously insurmountable technical problems standing in the way of developing a 200-mph locomotive drawn train. The fact that the literature does not report further developmental work in France (and only vague and scattered references to similar trials elsewhere) would therefore appear to indicate that perhaps the estimated cost of providin the necessary solution was excessive at the particular time and place; or that the projected costs of operating such a system were considered too high.

Economic Aspects: It may be inferred from recent discussions of high-speed ground transportation that costs are likely to be high operating on conventional (even if improved) track even if the technical problems which the short test runs exposed are solved. The elements of major cost in such a system are likely to consist of: (1) the cost of improving and relaying track; (2) the cost of providing electric power in a substantially new form (possibly linear induction transmission, capacitative-coupling power pickup, or microwave power pickup; all these methods being in their early and hence costly stages); and (3) the cost of protect-ing the right of way from weather and vandalism.

The PCR-Budd car - This is one of the Northeast Corridor demonstration projects, financed in part by DOT and in part by the PCR. The cars, mobile units 85 feet long, are each equipped with four 640-hp electric traction motors, designed to operate on the present 11 kV 25 cycle power or on the future 25 kV 60 cycle power to which the New York-Washington line may eventually be converted. Streamlining and light-weight (stainless steel) materials are employed but the heavy electrical equipment brings the weight to 165,000 - 170,000 lbs per car (depending on type). The trains are capable of being accelerated from standstill to 150 mph in 3 minutes. Braking is accomplished by means of a digitally - controlled electro-pneumatic system; emergency stops require a distance of 7750 feet at 160 mph initial velocity. A number of different automatic control and power systems have been proposed and two--one by Westinghouse and one by General Electric--are currently being installed in the 50 cars being built by Budd. Further automation will be possible in the future because redundant electric circuits for such potential use are being incorporated into the car. Both air and mechanical springing are used. Test runs over a 21-mile stretch of special track between New Brunswick and Trenton have delivered maximum speeds close to the guaranteed speed of 160 mph. The persons carried on these test runs have expressed satisfaction with the quality and comfort of the ride.

Technical Feasibility: A number of problems, described in the press as production problems, have delayed the building of the passenger cars. The original date of starting the new service has been moved forward several times since the originally promised date of mid-1966, and it has since proved impossible to meet the most recent deadlines of April 1968. There has been no announcement of a new deadline date. Thus, while a considerable number of test runs, employing test cars, have been conducted, the trains are not yet in operation. There is no doubt, that the train as developed by Penn Central and Budd is technically feasible.

However, Dr. Richard Rice, formerly head of Princeton University's Transportation Science Project has, according to the Philadelphia Evening Bulletin, (Nov. 19, 1967) described this project as "hastily conceived, terribly restricted in its technological concept and unrealistic in its fare plan." Broadly, the technological criticisms involve the factors of: weight (85-ton cars vs 60-ton cars in Japan); poor aerodynamic design (clutter underneath the car floors); inadequate provisions for safety (absence of chain link protective fences along right of way, retention of 22 grade crossings in Delaware and Maryland). While the comfort of the Budd built cars has been praised by those who have been on the test runs, one of the authorities consulted by the authors expressed the opinion that any vehicle possessing only one degree of freedom was fundamentally incapable of providing true passenger comfort at speeds much above 100 mph.

Economic Aspects: Approximately $55.5 million have so far been spent by the PRR and the U.S. Government on the demonstration project. Fare increases have been requested in the amount of $1.00 each on the New York to Philadelphia run, and the Philadelphia to Washington run, respectively. The time saved, at least at first, will amount to only 15 minutes on each of these two runs. It remains to be seen whether the savings in time will loom sufficiently large to the users of transportation to induce persons to shift from other means of transportation to the new "high-speed" high-fare runs. It should be noted in this connection that, unlike the situation with the Tokaido corridor several years ago, there is no dearth of ground transportation capacity between New York and Washington. The B&O-Reading passenger trains no longer operate on that run, and Penn Central schedules provide less service on these runs than they once did. It may well be that the public response to the new system will not be sufficiently voluminous to encourage further investment in improving the speed of the New York to Washington line. Yet elimination of the 22 grade crossings in the southern part of the run is essential if high average speeds of 100 mph are eventually to be reached.

The United Aircraft Train (Turbotrain)- This is another Northeast Corridor Demonstration Project, and the cars built for the run will operate between Boston and New York. The new trains will be fully articulated, gas-turbine powered and built of lightweight materials. Trains can be built in lengths of three to nine cars. On the New Haven line the trains will consist of three cars powered by six 450 hp gas turbines delivering 2700 hp. They will be run initially at 118 mph cruising speed, and the New York to Boston run is expected to take three hours. Eventually top speeds of 160 mph will be reached.

Technical Feasibility: Tests conducted indicate no particular technological problems; in fact, the new designs have been subjected to detailed studies which indicate that with no changes in present road beds or existing curve radii, speeds of the new trains can be as much as 30% greater than the current ones.

Economic Aspects: It is interesting to note that the Canadian National Railways have ordered trains from United Aircraft which, while not designed to operate at speeds of 150-160 mph (the top speed being only 120 mph), will in other respects be very similar to the above-described ones. These CN trains are being produced in five-car-articulated units, and seven such have been ordered. The light-weight Canadian trains are expected to produce the kind of ride at the speeds that will make them competitive with other forms of transportation.

The Rrollway- Technologically, the Rrollway and its German parallel, the Rollbahn, are tracked vehicles, differing from conventional railroad trains in that they require extra broad-gauge tracks -- 17'-8 1/2" for the Rrollway and about 10 feet for the Rollbahn. The wide trains would also provide seats for their passengers; the Rrollway would carry 12 automobiles, at right angles to the direction of motion; the Rollbahn would load autos along the direction of motion with two automobiles abreast, and two tiers of cars.

The Rrollway trains would be designed to operate at speeds of 125-150 mph on steel rails, with steel wheels. The U.S. proposal for such auto-ferries is justified by its author on the ground that automobiles are the most popular means of intercity locomotion (87%); and that any attempt to solve intercity transportation problems must recognize that the only way by which sufficient volumes of traffic can be generated to make a new system viable at the fares needed, is one which recognizes the American desire to use the automobile at the end of this journey. Because the system uses the private automobile at each end the stations can be placed at low traffic density locations.

Technical Feasibility: The designer of the Rrollway (Deodat Clejan of the General American Transportation Company) planned to use conventional railroad technology in the initial stages, with such modifications as would be dictated by the width of track and cars. The width of the car and its low center of gravity should provide stability and passenger comfort. There would appear to be no fundamental technical obstacles in the way of developing such a system. Some obvious problems suggest themselves, such as switching problems, suspensions, allowable curve radii and superelevations, drives, aerodynamic design, but none of these are of a roadblock character.

Economic Aspects: If one were to judge by the European experience with "autocouchettes", i.e., trains which ferry automobiles along with their owners, it would seem that a similar move, with the modifications described above, would prove very popular in the United States. It should be noted that the loading and unloading times required in Europe are of the order of 45 minutes to one hour; and that the Rrollway would provide much more rapid loading and unloading, with the further advantage of higher train speeds than are currently available on the European railways.

Whether the Rrollway would actually prove popular enough to remove a large segment of the motoring population from the highways is very much a matter of economics: for the business man, the time required to travel between termini would have to be competitive with the airplane plus rented car or taxi, and the same would be true of the cost. For the private traveller, the time would not necessarily have to be nearly as short as that required for airplane travel; but the matter of cost would be of great importance -- the cost of transporting a family by rail is at present higher than the cost of traveling by automobile, and the added cost of moving the family car together with the family from one end of a trip to the other, over a right of way that yet has to be built, and the land for which must be purchased at present-day prices, might well prove to place the "Rrollway" out of the reach of the family on the road for private reasons.

Another criticism has also been leveled against the basic concept of the Rrollway -- namely, that it will provide additional capacity where it is least needed, i.e., between cities, and fail to provide it where it is needed the most, i.e., within urban centers.

Linear Motors While in principle any motor can be unfolded into a planar propulsion device, serious consideration to such devices, which have been discussed in principle for at least 80 years, has been given only to the linear induction motor. The advantages of such a motor over other linear motors, is that power need be supplied to only one of the two windings, the stator. The principle of the linear induction motor is that the magnetic field which is induced in a short circuited rotor winding tends to drag that winding along with the traveling electro-magnetic field which is induced in the stator winding. By developing both rotor and stator into a plane and separating them physically, expensive and heavy gears can be dispensed with. The disadvantage of the induction motor for traction is that it is essentially a constant speed machine, and, therefore, the speed of the system can be made to vary only through changing the frequency of the alternator current or through electro-mechanical changing the number of poles in the stator. Experimentation on the use of the linear induction motor for traction purposes is currently going on in a number of countries; Japan, the United Kingdom, where two small experimental motors have been built (one and five horsepower), and the United States, in which an experimental 2500 hp motor is being designed with demonstration funds.

The power for these motors can be supplied either to the rail or to the railroad car. The advantage of the former system is that it does away with the need for a pantograph or other current-collecting device on the railroad car. On the other hand, the rails will be at other than ground voltage, so that in essence such a system is not feasible except for urban transportation systems, in which the transmission voltage need not be too high. The advantage of having electric power transmitted to the car is that it simplifies the problem of cooling (a linear induction motor is only about 60-75 percent efficient so that heat dissipation becomes expensive when the motor is stationary).

There are no serious technological obstacles in the way of developing such motors. What is involved is a trade off between one kind of complexity, namely transmission and gear box complexities in the case of conventional electric motors, gearing in the case of gas turbines, weight and gearing in the case of diesel engines, and the relatively low efficiencies and complexities of electric systems in the case of the linear induction motor.

The Gas Turbine - This method of propulsion has, as has already been stated, been adapted to the United Aircraft Turbotrain, to similar trains being developed for the Canadian National Railways, and to the Turboliner trains which the Budd Company is manufacturing for the Long Island Railroad. Basically, such turbines are adaptations of similar prime movers which have proven their worth in the aircraft industry.

Rights of Way - The methods currently being proposed for moderately high speed passenger transportation (to 150-160 mph) are currently well known and researched. These include welded rails, cushioned rails supports, and electric arc rail cleaners. The welded rail has been tried out in freight service, and is now being adapted to use on passenger lines. Rails of standard length (33-39 feet) are butt-welded together to form lengths of approximately 1400 hundred feet. Between two 1400 hundred foot lengths of welded rail is a 39 foot length of standard rail. The purpose of this system is to eliminate the clacking noises which are a standard feature of the old rail systems, and which passengers frequently find annoying. Passenger comfort is presumably to be further assured by cushioning rails supports (as well as by providing new suspensions), and such support systems create no particular technological problems. Electric arc rail cleaners mounted on trains have been shown to be capable of cleaning minor irregularities off rails even when the train carrying them is moving at speeds upward of 100 miles per hour.

Improvements in Command and Control Systems Including Routing and Safety: This whole area has been undergoing evolutionary changes. As train speeds increase, it becomes increasingly important to automate two functions; speed control and safety. The first has become necessary since it has been found that the human being is incapable of strictly adhering to a required speed profile; the same being true with regards to braking. Computers have taken over the function of determining the amount of power to be supplied at every given instant to the train, and the same is true with respect to braking action. A number of such systems have been developed and tested and are currently in use. Radar and radio have been proven unequal to the task of providing reliable communication for safety purposes, or for communication between trains, between trains and the computer center, and from the computer center to the trains; so that modern systems all depend on physical connections between points via wires (e.g. the "wiggly" wire system).

The technology of automatic control has been greatly improved. Sections of the Berlin subway are operating under automatic control and it is expected that within a few years the entire Berlin line will be automated. Similar prospects are in store for the London Underground. The NTL line in Japan will also be automated shortly. It therefore appears that automated operation can become a technical reality within a few years, provided that other means to ensure safety (protection against vandalism and weather) are simultaneously introduced.

Faster Movement of Freight: Traditionally, railroads have depended upon the marshalling together of long strings of freight cars into trains which are one mile to five miles and more in length. While this, in the opinion of the railroads, makes economical operations possible, it has also had the effect of causing the railroads to lose business to the truckers on the one hand and to the airlines on the other. In an attempt to reverse this trend, a certain number of new developments have been introduced. These involve the concept of an integrated transportation system involving all modes, intended to extend the assembly line principle all the way to the retailers shelf. In order to re-enter the picture, the railroads have developed the piggy-back system, which permits the loading of fully loaded truck trailers, or of specially designed and dimensioned containers, on flat cars. Part of the same general movement is the development of containerization, which, while perhaps not utilizing fully the space available in the cars, overcomes this drawback by increasing speeds of loading and unloading. These developments have also entailed the use of a number of well known techniques, such as the installation of traveling cranes in switch yards, specialized piggy-back equipment (e.g. mechanical breather units equipped with atmosphere control systems), and, in particular, computerization of equipment-control systems. Very much in the forefront of the thinking of the railroad's large industrial customers is the need for the railroads to provide specialized equipment which will result in more rapid handing of freight from door to door, provide continuous checks on freight car locations, and enable further integration of all the modes of transportation--truck, railroad, planes, ships--to provide more of the kind of service that the customer wants.

The Unit Train - In its ideal form, the unit train is a type of "freight commuter service". It is a fully integrated unit for handling bulk commodities, such as coal, from a source of supply to a particular terminal location, on schedule. The common delays encountered in ordinary freight service, namely waiting at the marshalling yards, waiting on the sidings, delay in loading and unloading, are all eliminated through the use of high-speed mechanized equipment at each end of the process. In this ideal form unit trains are capable of effecting extremely large increases in the percentage of capacity utilization, as may be seen from the fact that the average freight car is to believed to cover an average of about 15-25 miles per day, while a unit train could easily cover 300 miles in the same period.

None of the above, as may be readily seen, involve any radical innovations in the technology of producing transportation services. Rather, they involve a utilization of existing technology coupled with computerization, automation, and the introduction of new concepts which involve the use of specific purpose equipment, as contrasted to the general purpose equipment which appeared to be the more conventional method by which the railroads supplied both passenger and freight service. A further example of this type of approach is provided by the intentions of the railroads to serve airplane-type meals on some of the trains plying between Boston and Washington on the Northeast Corridor.

B. New High Speed Ground Systems (approximately 300+ mph)

Two important factors have focused attention on high speed ground systems which would be capable of competing with the airplane in the Northeast Corridor, at least in terms of total city-to-city travel time. The first of these is the fact that the air space above the major cities in the Northeast Corridor, and to a lesser extent in other sections of the country, has become extremely crowded; the implications of this situation with regard to passenger safety are of course obvious. The second consideration is that the modern jet plane is essentially a long-distance "machine", with its most economical inter-city distances far greater than the 200-250 mile distances between Boston and New York, or New York and Washington. It should also be pointed out that the modern airplane can significantly reduce total travel time between cities, (or at least can do so in the future when the 150+ mile per hour trains begin to operate), only when the distances between such cities exceeds 300 miles. The above considerations, coupled with the fact that population of the Northeast Corridor is expected to increase from its current level of about 38 million to 50 million by 1980 and 65 million by the year 2000, have all pointed to the need to expand total passenger transportation capacity (and freight as well) to suitable levels. A number of solutions have been proposed, some, as before, based fundamentally on technology which is currently in actual use even if not on a large scale; others based on principles which have not as yet been thoroughly studied.

With respect to vehicles, there is considerable interest in GEM (ground effect machines), or air cushioned vehicles. Vehicles of this type are designed to reduce vehicular friction in motion through the insertion of a cushion of air between the vehicle itself and the medium in which it operates (i.e., land or water). From a technical point of view, a distinction can be drawn between air cushions of the order of 0.001 - 0.02 inches, which act as a type of low-friction bearing, cushions up to perhaps one-half to one inch thick, and cushions of the order of inches to feet; the last type being used to ride waves that are present in bays, channels, etc. The first two types have been seriously considered for use in land transportation. Since a vehicle of this type cannot be maneuvered with the precision demanded of a land vehicle which is to operate at more than moderate speed, all such systems that have been proposed for use in high-speed land transportation are designed with guideways to keep the train along a prescribed path. Currently receiving wide-spread attention are several French, British, and American-designed and tested systems, as follows:

Aerotrain-This French ground effects machine uses a guideway in the form of an invert

T, with the upright bar of the guideway serving as the constraint mechanism by means of which the vehicle is kept to the path. A vertical air cushion is provided on each side of the upright of the T, and keeps the vehicle clear of the guideway even under the action of various transient forces such as winds, etc. The test vehicle is 10 meters long, 2 meters wide, and 1.6 meters high. Power is provided by a standard 260 horsepower light airplane engine driving a conventional reverse pitch propeller which is mounted on the superstructure and is approximately 4 feet high. Braking is obtained by reversal of the propeller pitch. Auxiliary braking is provided by pads which grip the center upright in the manner of a conventional disc brake. Finally, a third means of braking consists of cutting off the lift air supply. The experimental aerotrain has been operated for about 10,000 miles, and the principle of this type of operation is considered to have been shown to have been feasible. Currently, a 12 mile section of a full-scale aerotrain system is to be constructed, and is to be used as a test line for the final shakedown before being utilized to carry passengers.

The test vehicle has been operated at speeds as high as 188 miles per hour. The larger scale operational system is intended to carry 80 passengers at cruising speeds of 155 miles per hour. It is intended to use this vehicle eventually on intercity travel, employing a vehicle carrying 80 passengers; with cruising speeds in the range of 155 to 250 miles per hour, depending on the run.

The vehicle now under construction will be equipped with two noise-insulated turbo-prop engines rated at 1300 hp. each, driving together one propeller. Evidently this method of propulsion will be quite noisy, since it is planned to dispense with the propeller completely in built-up urban or suburban areas and in stations, using at that time hydraulically retractable rubber-tired wheels at each end of the vehicle. Future units, utilizing linear induction motors when these have been brought to a suitable level of development, are also being planned.

These would eliminate objectionable noise.

Hovair, Levacar, Hovertrain - General Motors is currently developing the Hovair vehicle which would ride on a W-shaped trough of concrete with an air film of 1/1000th of an inch. The Hovair bearing would be maintained under a flexible diaphragm by a chamber which, according to General Motors, will permit the vehicle to ride over surface irregularities without any damaging contact. The Ford Motor Company has developed a system which they call Levacar, which would have an air bearing .01-.02 inches thick and would be propelled by a ducted turbo-prop on the rear of the vehicle. Where the Hovair would travel at speeds as low as 120 miles per hour, the Levacar was supposed to have been used in the 150 to 400 miles per hour range.

In England, the Hovercraft Corporation has been pushing the Hovertrain. Following considerable discussion as to the best type of guideway, a concrete rectangular cross-section has been selected. The roadbed will contain a continuous conducting rail as the translating element for a linear motor. Speeds would be in the 300 to 500 miles per hour range, to be obtained through the use of the linear induction motor with windings on the vehicle.

While the American vehicles (Hovair and Levacar) have apparently aroused little interest within the U.S.A. transportation industry or within those branches of government that operate in the field of transportation, sizable quantities or both private and government funds have been invested in both the French Aerotrain and British Hovertrain. At the present rate of development it would seem that the Aerotrain should be transporting passengers and freight, although perhaps only to a limited extent, before 1975. The Hovertrain, which plans to use the linear induction motor as the propulsive device, will require a longer period of development, partly because the linear induction motor has not yet been produced in the larger sizes suitable for transportation purposes, and partly because it is only now that a stretch of test track is being built in Great Britain in which the various experiments on the Hovertrain will be conducted. It would seem likely, however, that the vehicle should be in the pilot test stage by 1975.

It has long been recognized that ground transportation systems operating at high speeds would probably need to be enclosed in order to protect line and passengers from sabotage, vandalism, or even the effects of bad weather. The view that some kind of enclosed space such as a tube would probably be needed has led to the development of two novel systems:

Foa's Tubeflight System, and Edward's Gravity Vacuum System. The Foa design starts with a totally enclosed guideway. The tube within which the Foa vehicles would run could be optionally above ground or below ground. The radius of the tube which would accommodate the vehicle would exceed that of the vehicle by about 1 foot on all sides, therefore entailing only low tunneling costs if tunneling is required, since tolerances need not be too precise despite the high speed at which the system is expected to operate. The vehicle has been described as an "air-gulping" machine. The air directly in the path of the vehicle would be scooped in, compressed, and then ejected aft through skew nozzles which would service a double-pitch air screw or bladeless propeller, at vehicle speeds of about 300-500 miles per hour. Air pads above and below the vehicle's center line would maintain clearance between the walls of the vehicle and the tube's inner surface, while banking on curves would be no problem because the forces acting upon the vehicle would be restorative and so tend to prevent its collision with the tube walls. Takeoff might be accomplished through an air-bearing system such as the ones used in General Motors Hovair or Ford's Levacar; it would also be possible to equip the vehicle with retractable wheels. Braking would be accomplished possibly by reversal of thrust, possibly by turning off the propulsion motors and allowing the vehicle to act as a leaky piston as it thrusts against the wall of air ahead of it.

For long-distance travel Professor Foa has suggested a supersonic vehicle which would act, in effect, as the centerbody of a ram-jet engine; however, the hot gases would not move with respect to fixed walls, the centerbody moving instead with respect to both the gas stream and tube walls.

Experiments have been conducted on this concept, employing for this purpose an experimental tube 2,000 feet long, through which 12-inch trains have been operating. Speeds of operation have been approximately 125 miles per hour. Part of the program has been funded by the Army, and part by the DOT.

A high speed transit scheme advanced by L. K. Edwards involves an accurately constructed enclosed guideway with only small local irregularities so that no isolation would be required between it and the train. The Edwards System would employ a metal tube, with rails on its interior, which would be used to support and guide the train but not to provide traction. The entire tube would be underground, floated on water or suspended on springs inside another tube, thus providing the necessary flexibility which changes in temperature, passage of trains and other forces might require. Both tube and train would be approximately 10 feet in diameter, with less than an inch clearance between tube and train. The tube would be so designed that its maximum elevations would occur at passenger stations, and it would begin and continue to dip downward from one station halfway to the next station, at which point it would begin to climb upward again. Propulsion would be provided by evacuation of air in front of the train. Atmospheric pressure at sea level would be sufficiently high to provide a 70 ton thrust on a vehicle the size contemplated (i.e. 10 ft. diameter). This force, coupled with the effect of gravity, would permit the train to operate at speeds as high as 500 miles per hour. The tube would dip, perhaps, 1300 feet between stations in urban systems, in which these stations would be 3 miles apart; for intercity travel the tube might go as far as 1 mile below ground. The capsule would be brought to a stop at stations partly through the effect of gravity and partly through the gradual increase of air pressure, since evacuation of air in front of the capsule would be stopped when power was shut off.

No serious technical objections have been raised against the concepts embodied in the Foa system. The speed with which progress can be made in moving from the small scale experimental stage to a pilot stage will depend to a large part upon the amount of funds available for research in this field. It does not, however, seem likely, at the present writing, that work will have advanced to the point that full-scale tests can be made upon this system by 1975. The most that can be expected is that some experimentation on larger scale models will be underway by then.

The situation is quite different with respect to the Edwards tube. While the proposed system possesses several attractive features, such as extremely low power costs, extremely high speeds with little or no passenger discomfort, and the fact that no money need be spent in acquiring rights-of-way, which can become quite expensive within cities; a number of serious objections have been raised on the part of knowledgeable people against the proposal. Aside from the psychological question of whether passengers would be prepared to ride in a system a feature of which is traveling in vacuum about one mile underground, it has also been pointed out that there are a number of real technological problems still remaining to be solved. One of these, the cost of drilling tunnels, is in part an economic one but to a very large extent also a technical one: it has been claimed that the laying of an air-tight tube over the distances envisaged is beyond the ability of current technology to accomplish; current tunneling and tube-building techniques not being sufficiently precise to permit the kind of dimensioning which such a tube within the tunnel would require. In addition there are a large number of important problems. One of these is the valving of the tube, which must be pneumatically sealed off from the station. Another is the removal of enormous masses of air present in a tunnel several miles long. A third is the problem of maintaining the integrity of the air seals within the tube. A fourth, is the pressure transient in the stations, i.e., massive air ducts would have to be provided at the station in order to provide the slug of air which would move the train out of the station and into the tube. A fifth relates to the possibility of passenger discomfort resulting from transient waves due to the passage of the train through the tube. Finally, the thought has been expressed that the combination of the above listed factors add up to a danger that breakdowns within the tube would result in immediate loss of life of the passengers.

Motive Power and Support Systems - The types of motive power which these new types of high speed transportation systems would require have already been implicitly described above. Briefly, they include the linear induction motor, ram jets for providing both lift and forward motion, gravity vacuum, and aircraft engines or turbines. Likewise, support may be provided by an air cushion or a gas bearing in the case of the several ground effects or air cushion machines, or by rails. Recently, a novel method of providing off-ground support, similar to that provided by an air cushion, has been suggested:

The Magnetically Suspended Train - This concept would employ tracks which would be constructed of closed loops of aluminum wire. The train itself would be designed around a highly insulated substructure. This substructure would contain a cryogenic unit carrying helium gas or liquid, and capable of bringing the temperature of a set of windings on the train down to the point of superconductivity. Currents of the order of 330,000 amperes through the train windings would be sufficient to raise the train some six inches above the track. The magnetic moments would be sufficiently great to correct for either lateral or vertical displacements caused by for example, wind gusts.

Technical Feasibility: The concept is at present in the exploratory stage only. It is not clear at the present time whether the technology of providing vessels for the liquid or gaseous helium is sufficiently far advanced to make transport of the material at high speeds safe enough to be used in passenger transportation. It should be borne in mind that the temperatures at which superconductivity comes into play are near absolute zero, and that therefore both passenger safety and insulation of large masses of helium become technological problems of very high importance. It may also be noted that until funds are provided for research into this question, and at the present time there appears to be no such plans under way, it is very unlikely that magnetic suspension will become more than a laboratory curiosity by 1975.

C. Commuting Systems and Urban Transportation

This subject is of importance to a future Commonwealth Department of Transportation for a number of reasons, of which the following two are the principal ones: First, because unless adequate transportation is provided within cities it may become impossible for cities to develop the levels of economic activity and transportation demand which are considered important to the future of Pennsylvania; second, because the precise nature of the solutions offered and adopted will affect the disposal and type of expenditure of state funds.

Much of the technology which has been described in the preceding pages has implications for urban transportation as well. Several modifications in thinking and approach are, however, needed. To begin with, the benefits which intercity transportation is presumed to derive from higher passenger speeds is lost, beyond a certain point, when urban transportation is considered; this is because stations are spaced much closer, and hence the time spent by a train at stations forms a much higher percentage of the total operating time of a given train. Second, large city urban transportation systems comprise a variety of vehicles, systems, and operating conditions. The decision to build a new subway line is thus a decision of a different order of magnitude and also qualitatively different from a decision to increase the speed of trains operating on a particular line. The privately operated automobile has created congestion in the center of the city, has reduced revenues of the public transportation systems, and has, because of its ubiquitousness, tended to draw business (particularly retail business) away from the central business districts of cities into outlying areas. Urban transportation is therefore being viewed as a global concept, requiring coordination of the private automobile, the bus, the streetcar line, and the subway or elevated system. Solutions for urban transportation problems have therefore centered around the provision of vehicles, some old and some new, which would be in some sense publicly operated and yet responsive to the demand of the individual commuter and fringe area resident. It has been hoped that the solutions will help reintegrate the outlying areas with the centers of cities, solve transportation problems, provide for uninterrupted economic growth, improve land use, etc., etc.

As in the case of intercity transportation, a number of the proposals or plans represent improvements to existing systems, based upon technological advances that have already been made and tested. In the Philadelphia area, the Delaware River Port Authority is extending the Philadelphia-Camden high-speed line, which currently operates trains over the Benjamin Franklin Bridge between Camden and Philadelphia by another 10.5 miles so that both together will form a 14.5 mile high-speed lin between Lindenwold, New Jersey, and Center City Philadelphia, picking up passengers from seven stops along the way. The cars currently being built by the Budd Company will have a top speed of 75 miles per hour, with the cars to be used for peak and daytime operations seating 80 each and operating in pairs, while the cars to be used during the off-peak runs will be operated singly and seat 72 persons. Average speed over the 14.5 mile distance will be approximately 38 miles with a top speed of 75 miles per hour. Nighttime trains will be fully automated, so that the train attendant will be in the position to collect fares from passengers boarding the trains. Motors will be electric, operating from a 600-volt d-c. third-rail system. Braking will be a combination of dynamic and air . Two-way communication will be provided between the train attendant and the dispatcher, while a public address system will permit the attendant to make announcements to passengers. Following an extensive shakedown and de-bugging program, the line will commence operation in September, 1968. All of the technology is conventional, trains, trucks, motive systems, braking systems, etc., all having been tested in previous applications or through very extensive tests preceding their introduction into the new system.

The Skybus Transit Expressway (Westinghouse) - The technical feasibility of this new vehicle and system was tested during 1965-1966 in Pittsburgh's South Park. The vehicle is all electric, resembles a bus, and rides on four pairs of driven pneumatic tires. The roadway consists of two tracks, each a 22-inch wide concrete ribbon with a steel I beam, called a guide beam, riding between them. The beam is used by the guide wheels on the vehicle to steer each axle and to position and lock the vehicle to the roadway. Operation is completely automatic, does not require any on-board help, and the system can be programmed to operate the vehicles either individually or in multiples. As suggested for use in Pittsburgh, the vehicles would be operated round-the-clock on a two minute headway. During rush hours as many as ten cars might be coupled together. During off-hours cars could be operated individually. The entire operation, including fare collection, would be completely automated. A study of the transit expressway, or Skybus, by the MPC Corporation, concludes that the basic feasibility of the system has been demonstrated, that a commercial system is entirely feasible, provided that further work is done in several areas (e.g., aerial structure design parameters, track running surfaces, vehicle body design, command and voice communication systems, voltages and drive trains) is conducted. The same study evaluated the economics of the system and came to the conclusion that even if allowance is made for rises in prices and costs over the next 30 years, the system should be economically viable at a 35¢ fare, provided that the system is not taxed and that acquisition of right-of-way costs (which are expected to be small) be disregarded. The system would appear to be suitable for cities of medium density, with rush hour capacity rising as high as approximately 20,000 persons per hour.

The Long Island Railroad - This commuter line will receive 270 cars, called Turbolins during late 1968 and possibly in 1969. These cars are being built by the Budd Company, have been ordered by the New York MCTA (Metropolitan Commuter Transportation Authority) for use on the Long Island Railroad. Top speeds will be approximately 100 miles per hour, the cars will have a passenger capacity of 122 persons, will be 85 feet long, and will be lightweight. They will be powered by both gas turbines and electric motors, thus making it possible for these cars to operate in the Manhattan tunnels.

The Bay Area Rapid Transit District (BARTD) - Three counties in the San Francisco area are planning a high speed electric rail system in which the average speed goal will be 40 to 50 miles per hour with top speeds of 80 miles per hour. To attain these averages, the system will operate a conventional rail system with relatively conventional cars, running between widely spaced stations which will be fed by automobiles and buses. At the present time a maximum interval of 15 to 20 minutes is contemplated between trains, but rush hour headways will be 90 seconds. The 75-mile system will consist of 20 miles of subway, 24 miles at grade, 31 miles of aerial structures. It will have a capacity of 30,000 seated passengers per hour per track. All train operations will be completely automatic including acceleration, deceleration, stopping, opening and closing of doors, with fare collection being self-service through either commuter tickets or through a monthly billing system. It is expected that this system, which is estimated to cost upward of 1 billion dollars, will effect time savings sufficiently great, at fares sufficiently attractive, to reduce the number of automobiles traveling into the center. For example, the Oakland to San Francisco run is expected to take 8 minutes versus 30 minutes or more by car. The basic fare will be 25¢ with increments based on distance, the average commuter cost being $1 per trip. The estimated completion date is 1971.

The above four descriptions by no means exhaust all operational or nearly operational urban transportation systems in various cities. These operational systems are characterized by the fact that they make use of existing technology, or at most of not completely proven technological advances or systems. In addition to these, and other expansions of existing systems in other cities, are such proposals as General Motors Metro Mode which is essentially a proposal to utilize already developed buses to operate on the private or semi-private rights-of-way in outlying areas, and on the public streets within the centers of cities. The restricted rights-of-way on which these buses would operate might be obtained, where feasible, by adding lanes to existing highways. Such restricted rights-of-way are of course by no means new. Chicago's Congress Street Expressway (the Eisenhower Expressway) has tracks running down the center with the outside lanes being used by motor vehicles of various types. Part of the justification for the Metro Mode is that buses provide greater flexibility, not being restricted to any specific rights-of-way within the city. There is, of course, no technological problem here; the only point at issue being whether the benefits justify the cost, or whether indeed such a system is possible everywhere.

The Rail-Bus - An interesting attempt to increase both flexibility and speec of rapid transit systems is embodied in the rail-bus. This is a bus equipped also with 12.5 inch retractable rail wheels. These make it possible for the vehicle to operate on standard railroad racks and highways. The vehicle has been tested in New York City, where its purpose is to cut down travel time between Manhattan and Kennedy International Airport by employing the Long Island Railroad tracks for part of the distance. It has also been tested by the Philadelphia Suburban Transportation Co. (Red Arrow Line), operating between Philadelphia and its western suburbs. The latter tests ran into difficulties when heavy snows clogged the wheel systems. However, the problem has been apparently largely resolved through improved wheel systems. The Red Arrow Line has recently announced that it is planning to institute rail-bus service between Media and Center City Philadelphia.

Monorails - Also old in concept, but never used in recent years on any wide scale in mass transit, is any one of the many versions of the monorail. A study of 21 alternative transportation systems conducted for the city of Manchester, England, rejected 15 systems on various grounds, but among those which were considered are the following: Alweg, which is a bottom-supported monorail vehicle with rubber tires running on a concrete beam; and the Safege, which is a suspended monorail vehicle with rubber tires running on a concrete beamway. These two systems, together with the "Houston" monorail, which operated experimentally in that city, have demonstrated their technological feasibilities over short, closed-loop distances. Examples of the Alweg system are to be found in Disneyland (2-1/2 miles), the Seattle World's Fair (1-1/5 miles), and in Turin, Italy, Examples of the Safege system were demonstrated at the New York World's Fair and in Orleans, France. The Uouston type of Monorail was subsequently installed at the Tokyo Zoo. All of the above examples basically possess no switching facilities. Monorail links are currently being considered between the Minneapolis and St. Paul business Districts; between Houston and Galveston; between Washington and the Dulles Airport; and in several other locations. All proposals to construct such systems seem to be primarily limited to what might be called straight-line routes, i.e., routes without branches. Such routes, of course, require no switching; this has been, and continues to be, an important and difficult technological problem because of the need to move heavy sections of monorail.

Technical Feasibility: Monorail systems have been widely criticized on several counts. The first is that maximum speeds reached so far have fallen considerably below 150 miles per hour. This, however, would not rule out the use of monorail systems over relatively short distances in which, because of the need to stop at rather frequent intervals, high speed is not important. In fact, the Houston to Galveston monorail and the Washington to Dulles Airport monorail, which are perhaps the longest ones cited in the literature, would each make several stops enroute. Another criticism which has been leveled against the monorail concept is that some of the variants of this system are not true monorails. In some of these systems the train is supported at two points, as is the case with the conventional track, the difference being that the two rails on which the monorail vehicle rides form an integral unit rather than two distinct units. Other criticisms of the monorail system are that supporting structures will be heavy, that costs will be approximately the same as for the conventional duo-rail system, that noise on a new monorail system will be no less than noise on a new conventional system which has been suitably designed, and that high speeds still need to be demonstrated. A clear-cut decision on the technical suitability or superiority of monorail systems will probably need to wait upon the development of accurate design and acquisition cost figures in the various locations for which monorails have been proposed. In the meantime, it does not appear as though the monorail will be an important competitor of existing systems by 1975. However, close attention should be paid to the results of the economic studies which are being conducted in the various cities mentioned previously.

Minibus - Among solutions which were offered to the problem of providing effecient and popular mass transportation is Washington's Minibus system, which employs a fleet of 14 small buses with 18 seats and room for 12 standees, and operates on 2 minute headways between the major downtown retail outlets. The fare has been 5¢, trips are short, averaging 2 to 3 blocks in length, and the entire system has proven to be extremely popular. The entire trip length is 1.86 miles. Average operating speeds through the center of the city are of the order of 3 to 4 miles per hour. The system has effected a 4% reduction in vehicular traffic on the Minibus streets and has slightly increased bus ridership.

The preceding descriptions (with the possible exception of the Minibus) are all planned on the basis of programmed headways between successive vehicles. In addition to these, there have been a number of proposals which either use existing vehicles, or else introduce new vehicles, or else provide some combination of old vehicles and new guideways to provide transportation on an on-demand basis.

StaRR Car - This very interesting concept includes a compact vehicle, a guided track, automation, and charge accounts. It would provide transportation between suburbs and city centers in the following manner: The commuter would enter a compact 3-seat auto, insert an identification card into a slot on the dashboard which would activate the automobile starter and at the same time signal a computer center that he is to be charged with the vehicle. He would then drive off in the vehicle, which would be powered by a small gasoline engine, to a central collection point. At this collection point, he would enter a guided automobile track which would accept the rubber-tired wheels of his StaRR car. From there he would enter into an entrance ramp and an acceleration lane. The gasoline engine would be automatically cut off and the driver would then dial a destination. From this point on the vehicle would be automatically accelerated via its electric motor, assembled into a train with other such vehicles, and automatically driven into center of city at about 60 miles per hour. At the proper exit the car would be magnetically uncoupled from the train and decelerated on to an exit ramp. The driver would then drive into a special garage or lot in which his car would be parked bumper-to-bumper with other cars. On leaving he would take the first available car and go home, reversing the procedure.

Technical Feasibility: There would obviously be no technical difficulties in the way of developing such a vehicle and system other than the problems normally encountered in a new design. Otherwise it can be said that the technology for building and routing such automobiles, for constructing entrance ramps, guideways, parking lots, is currently available. Equally clear should be the fact that, in view of the fact that no funds have as yet been devoted to a study of prototypes of such a system, the minimum length of time which might elapse before such vehicles became available for mass transportation would be approximately 10 years.

Economic Aspects: The main objection to such a system is not a technological one but an economic one. As is well known, the load or utilization factor in any public utility system, whether in transportation, communication, or electric power and gas production, is low. This, despite the fact that buses and commuter trains operate in excess of 100% of rated capacity during rush hours because a large percentage of the people riding the cars are standees, and headways between buses or between trains are very short, of the order of two minutes during these rush hours. During off-peak hours, on the other hand, headways are much longer, trains in particular are much shorter than during rush hours, and not all the seats are occupied. A random demand system such as that proposed here would by definition never have any standees, the vehicles would be garaged during the day and all night so that the load factor or utilization factor would be extremely low. Add to the above the fact that special guideways would have to be built and special parking lots provided for the StaRR car, and it will be easily seen that the cost of any such system would be extremely high. It should be further noted that in essence such a system is geared to the needs of people residing on the outskirts of a city. It makes no provision for the fact, that as matters stand, a sizable number of people who live not at the center but fairly near it ride in a counter-current direction towards their jobs in the morning and from their jobs in the evening. This is another factor that would result in a extremely low utilization of rolling stock. The fares required to make such a system self-supporting would probably be extremely high.

Larson System - This is another proposed system which would provide random schedule service. Under this system cars operating at constant cruising speed on a main track would be used. The system would operate as follows: A passenger would enter a station which would sit above the main track, punch a button on a callboard indicating his destination, and wait for his car to arrive. Each car would bear a designation sign showing the station to which the passenger intends to go, so that only those proceeding to that particular station would enter that car. Once the doors close the car would be introduced via appropiate sensing devices and computer programs into the main track, where it would travel at main line speed. Upon approaching the station of destination a pair of retractable wheels would be extended sideways; these extensible wheels would then engage a track of wider-than-main-line gauge, and would climb this particular track to a level above the main line, thereby preventing the car from interfering with other cars proceeding on the main track. Three vehicle sizes and three classes of service would be provided under this system. The first would be a 12 passenger vehicle, which would provide third-class service; i.e., service under which the passenger would enter a vehicle and wait until it was filled, at which point the doors would close and the vehicle would proceed to the pre-programmed station. Second-class service would entail the use of smaller cars, perhaps 8-passenger cars, and would serve small groups who wish to travel together to a particular destination. First-class service would be provided by still smaller cars, and these would leave as soon as the first person enters the vehicle. The lift-off aspect would make it possible to provide direct service between station of origin and station of destination without any slowing down between these points. Provision could also be made for using the lift-off principle for connecting with branch tracks or cross tracks, speed being maintained or reduced as necessary during such switches.

Technical Feasibility: This proposal is in the idea stage. No funds have been allocated as of the time of writing in order to test the feasibility of the vehicle and the system. It should however, be noted that this, like the preceding system, is also a non-scheduled random demand device. As such, it suffers from the same drawback that other random schedule devices share with it.

First, peak utilization of capacity would be less than 100% per car, as compared with the conventional systems which have a peak utilization of perhaps 150% per car during rush hours. Second, no random demand system can provide truly immediate service. Any important local demand such as a department store sale, a sports event, etc., would create an accumulation of cars at some particular point; considerable time would be required to reintroduce these cars into the system since all main line traffic is traveling at high speeds. The problem of intermediate storage points would thus be an extremely difficult one to solve and at any rate would certainly be costly. Moreover, until the accumulation of cars at a particular point is exhausted, service at other branches or other points on the line would be slow.

Urbmobile - The Urbmobile is in many respects similar to the StaRR car. The vehicle, about the size of a Volkswagen, is equipped with a rechargeable battery and two sets of tires, one rubber and one steel. When riding around the streets the battery is used, the steel wheels are employed when the car enters the guideway. On the guideway, it would travel in the automatic mode, with a power pickoff. The period during which the car would be in automatic operation would also be employed to recharge the battery. The car would carry four passengers, and would have a top speed of 40 miles per hour and a range of about 40 miles while operating on the battery; in the automatic mode it would be expected to travel at around 60 miles per hour. Spacing and control of vehicles on the guideway would be controlle automatically. The vehicle has been developed by the Cornell Aeronautical Laboratory, which is working on the problem under a contract with HUD. It is believed that the system can be made operative by 1985.

Technical Feasibility: The major technical problems arise from the need to operate the vehicles nearly bumper to bumper at high speeds, to ensure safe entry and departure of the vehicles from the guideways, to devise appropriate routing programs and circuits, and to accomplish these ends while maintaining simplicity of operation. The question of what to do with the vehicles once they have entered the city has not been specifically answered. But it is clear that this vehicle raises the same question as do other random access proposals which would make use of low capacity vehicles. To illustrate the point, thirty conventional subway trains, each carrying 500 passengers and operating on a two minute headway, could bring 15,000 persons into the city in one hour. To accomplish this task with small vehicles carrying on the average at most two passengers per vehicle would require handling 7,500 cars in the city center in one hour.

The Teletrans System -Originally the Teletrans Corporation had proposed a system of small (2 passenger) automatically-routed automatic-fare-collection vehicles travelling in an enclosed tube. A linear induction motor with the rotor on the bottom of the vehicle was to provide propulsion. Maximum speeds were estimated at 120 miles per hour but the planned operating speed was 45 miles per hour. According to reports, further analysis disclosed that the problem of providing sufficient trackage for even a simple operation was a severe drawback to the use of this type of system. However, plans are now underway to install a modifiction of a Teletrans system, in the Detroit Airport, for the handling of passengers and luggage.

Automatic Taxi Train - This is a proposal similar to the above, originating in Great Britain. The design envisages a speed of approximately 35 miles per mile for vehicles traveling in an enclosed tube which, depending on conditions can be elevated, at grade, or underground. Design capacity would be around 5,000-6,000 passengers per hour. The Brush Electrical Engineering Company has a contract from the British Ministry of Transport for study of this proposal in relation to a design for a self-routing passenger-carrying system which would be fully automated.

The Integrator - This concept, developed by Bouladon of the Battelle Institute of Geneva, employs a continuous high-speed (approximately 20 mph) conveyor belt as the principal passenger conveyance. To obtain access to this high-speed belt at a given station, the passenger first mounts a special escalator, which is composed of detachable pods. At the point at which the passenger enters this device, the escalator is moving slowly at right angles to the main belt. As the pods approach the belt, they are given a lateral acceleration, so that at their terminal phase they are moving directly adjacent to the main belt, parallel to it, and at the same speed. The passenger may then mount the main belt, and eventually dismount at the station desired by him by entering another pod which mirrors the motion of the first set of pods. The speed of the main line would thus be constant. Other features of the Integrator are its light weight (100 pounds per passenger), its simplicity, and the low cost of power, which is estimated at approximately one-tenth of that needed for a conventional subway system. Power is applied continuously, permitting the use of simpler and stronger motors, and no energy is lost in braking. Performance is characterized by high capacity, ability to negotiate slopes as high as 12%, and small-radius turns (130 feet). Subway tunnels, it is claimed, could be converted to this system, which would have a capacity equal to four to five times the present peak capacity.

The escalator-pod system would itself form a continuous loop, so that persons would also be able to mount the escalator at one end and dismount it at the other end, where its velocity would again be perpendicular to the main belt, but away from it. The system could thus also be used as a means of crossing dangerous roads.

Technical Feasibility: Evidently the Battelle Institute has conducted sufficient preliminary research to indicate to its own satisfaction that the system would be both economically sound and technically feasible. However, such information has not been published in the references examined, and a number of questions which spring to mind have not been answered in the available literature: in particular, the means of imparting a lateral acceleration to the pods, the methods of providing seating arrangements or support for those standing on the main belt, the method of decelerating the pods at the other end of their travel, have not been described. Until more details are available, it would be premature to predict the date at which such a system would be ready for preliminary study, much less for use in mass transportation.

The Lewis Moving Pavement - In 1900 William Y. Lewis constructed three moving platforms at the Great Exhibition in Paris. These were three miles long, and each of them was three feet wide, moving at 3, 6, and 9 mph respectively. The moving platforms consisted of a train of closely coupled flat trucks on which passengers stood. Single speed installations have been recently estimated to cost approximately $1.5 million per mile (British figures) and provide a capacity of 5000 passengers per hour at speeds of 1.3-1.5 mph. Operating costs are not indicated.

Technical Feasibility: It is clear that the system can be built. Intended, however, as a mass transit system in crowded city central districts, it may be questioned whether that rate of speed would provide something that walking would not, particularly since the system would (a) not provide seating space and (b) probably be unusable by handicapped and elderly persons.

The Lewis Never-Stop Railway - This is a continuous spiral-drive railway invented in 1901 and used successfully in four tunnels under the East River in New York City. The system is reported to have averaged, under the particular set of conditions, 15 mph, as contrasted with the 12 mph which would have been feasible had a start-stop subway system based on 1901 technology been used. Acceleration and braking were reported to be smooth, and power regeneration equal to 80% for the deceleration period. (The pitch of the spiral, which amounted to 6 feet at cruising speed, was reduced to 1 foot at stations). A similar system was tried and operated successfully over 1.5 miles of track at Wembley in 1924. Construction costs are estimated (British figures for 1966) at about $1 million per mile of single track, and operating costs at about one cent per passenger mile.

Technical Feasibility: This has been amply demonstrated in the past. Moreover, experience has shown that wear and tear was minor (imperceptible at the end of one million miles of travel at the Wembley exhibition), fare per seat only one-third to one-fifth that of standard electric trans, and down time due to involuntary stoppages less than one percent. Nevertheless, despite the attractiveness of the system, it would appear that the problems of enabling passengers to dismoun and board the cars at the stations (despite the recommended design speed of 1.5 mph when passing through the stations) would create problems. In particular, the handicapped might find this speed too high for their ability, unless some other system were used as an adjunct (possibly a modification of Bouladon's escalator pods).

The system has been proposed for serious consideration by the IAAS* Working Party on Traffic for serious consideration by the City of London, where it could be used as a center-city loop system, with buses radiating outward from various points along the perimeter.

The Telecanap - This is a system exhibited in 1964 at the Swiss National Exhibition in Lausanne. Except for the fact that the method of controlling car speed is not described, the description would fit that of the Lewis Never-Stop Railway: cars maintain a speed of 9.3 ft/sec between stations, and 3.8 ft/sec (2.6 mph) at stations. The passengers disembark onto a turntable platform, the peripheral spee of which matches the train station speed, and leave the system by walking towards the center of the turntable, where exits are provided (staircases, etc.). Costs are estimated at about $800,000 per mile of single track. At average speeds of

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*The Institute of Architects and Surveyors

6 mph the capacity would be 9000 passengers per hour for a ten-car 97-passenger train installation.

Technical Feasibility: Since a pilot plant has been constructed, the system would appear to be technically feasible. It may be questioned whether municipalities in which a 9000 passenger peak capacity would meet the city's requirements would be able to finance a subway or elevated system which this mode of transportation would require.

The Passenveyor - Horizontal - This is an endless non-stop conveyor system that has the advantage of being able to negotiate corners and gradients, is provided with seats, and is protected from the weather. In the event of a power failure or emergency stop the average walk to an exit is only 12 paces. Accelerators would be provided by means of which passengers would be able to mount and dismount at stations. A specially designed car, called the Mark II, would be provided for the crippled and blind, who would seat themselves in a stationary vehicle which would then be automatically accelerated and coupled to the moving train.

Technical Feasibility: No detailed information has been presented in the available literature which would enable a judgement to be formed concerning its feasibility or suitability for particular volumes of urban transportation. It should be noted, however, that the system has been recommended as one of several alternate possibilities for the City of London (IAAS Working Party on Traffic); hence may be presumed capable of handling rush-hour volumes in excess of 20,000 persons per hour.

The SCAT System - A recently proposed solution to mass transportation in the core and belt of a city is the SCAT (small car automatic transit) system which would consist of trafficways and stations, route junctions where cars may change course, and small automatic cars. The idea is in many ways similar to the previously discussed Larson system, except that the system provides switching facilities at stations or route-changing junctions, which may be actuated from the car by push-buttons; with main line speeds remaining practically constant speed.

Technical Feasibility: This is a very recent proposal, which has not yet had the benefit of even preliminary design planning. It cannot be considered at this point as more than a suggestion, whose main advantage is that, if integrated with peripheral modes of transportation via the Transgrid principle, it would provide flexible and rapid transit throughout the center of a city. However, the strictures listed earlier to on-demand systems would apply here as well.

The PERC System - A solution similar to the above is the PERC (personalized capsule), suggested by MIT in its Project Metran study. This system would employ elevated guideways along selected streets in the high density areas, on which smal automated two-passenger capsule-like vehicles would travel. The question of propulsion is left open, although the linear motor is preferred because it is readily adaptable to any guideway system. The cars themselves might ride on wheels or use an air cushion. The channel capacity of the system, according to the preliminary descriptions, is in excess of 20,000 passengers per hour at a 20 mph operating speed. Stations would be in the form of off-line sidings, and be coordinated with parking facilities, office buildings, and department stores where feasible.

Technical Feasibility: It is recognized by the authors of this plan that the plan could not be implemented before 1990, since R & D and demonstration project testing would require long lead periods. For the rest, the drawbacks of on-demand systems would operate here as well.

The GENIE System - This system, designed for low density suburban areas, would employ low capacity (10 passenger) driver operated vehicles, operating without fixed routes or schedules. Requests for service would be made by phone to a central computer which would register the number of persons who had requested service and the zone number of the originating request. Arrival of a vehicle within a specified time would be guaranteed. The user would be automatically charged for the service. The system is designed to provide a solution of the "many-to-one" problem, i.e., the problem of bringing a number of persons from an outlying area to some central point close to that area, e.g. a shopping center. The outlying zones would be subdivided into zones one-half mile on a side, and the vehicles would each pick up passengers within their own zone, discharging them at such points as shopping centers, high speed transit stations, railroad and airport terminals, etc. The use of automated guideways is proposed for the future, with the vehicle operating in an automatic mode on such guideways, and on a manual mode on the regular streets.

Technical Feasibility: It does not appear that there would be any serious technical difficulties in the way of designing at least the first, or non-automated, stages of such a system. The major problem, it would seem, would be an economic one -- whether it would be possible to cover the cost of both driver and computer service to operate a vehicle which would carry only ten persons. It may also be questioned whether the volume of demand during the day would be sufficient to generate trips on a frequent enough basis to keep the rider satisfied and the transit company or authority solvent.

D. Physical Systems Designs

The preceding discussions centered around more or less completely specified combinations of vehicles with rights of way, propulsion systems, and control systems. The problem of providing transportation within cities and from city to suburb has however, also been viewed from a more general standpoint -- that of transportation objectives as viewed by the consumer of transportation services, regardless of the physical form which an individual vehicle and roadway may take. Viewed from this angle, it is felt that if the consumer of transportation services can obtain the requisite degree of comfort, frequency of service, speed, etc., he is not interested in the method of propulsion, nor of the materials of which the vehicle is constructed, nor in any of the multitude of other technical details which have to be taken into account by the supplier of such services.

This approach has led to the formulation of system objectives designed to supply the fundamental desires of the consumer by suitable marshalling of available technologies while at the same time providing flexibility which will permit the future introduction of new technology without drastic revision of the entire system. One system which has received widespread attention is the Transgrid System, developed by Dr. Thomas E. Stelson, of the Carnegie-Mellon University. The system geometry consists of an uncoupled grid, with each line on the grid thus being entirely free to use any technology which is suitable for conditions thereon. Frequent service would be the rule on each and every line in the system; thus, while transfers would be necessary for those passengers who could not complete their ride on one line, waiting times would be short and the currently prevailing dislike of transferring from one vehicle to another would not effectively inhibit use of the mass transportation system. Moreover, two alternate routes would be available to any passenger who wished to travel between two points not connected by a single line: e.g. a person wishing to travel west and south could travel the two legs both in the order named and in reverse order. Any line which could benefit from automation could be subjected to it without in any way affecting the scheduling or technology in any other line. All lines could be extended at will without suffering any deterioration in either service or performance. Grid spacing would need to be determined through a system analysis in order to balance local desiderata through consideration of such factors as distance walked to the nearest line, investment costs, etc. The flexibility inherent in this approach is self-evident. It is also clear that of itself, this approach does not solve the problems of increasing speed or mobility of center city travel;

so that the approach must be supplemented by specific technological measures for each of the lines in the grid.

Carrying the same general idea further is the Project Metran Grid System, of the Massachusetts Institute of Technology, which applies the idea of an uncoupled grid design to the specific geography and topology of the Boston area. The system as outlined would reserve some center city streets for bus use, to form an orthogonal grid. This would be supplemented by e.g. the PERC system which would give access via high speed express lines to the outlying areas. Within the outlying areas, the GENIE system might be employed. The integration of the three modes into a system to serve the Boston area, supplemented perhaps by automated highways, is clearly dependent on the length of time that it would be required to develop the necessary technology; i.e., it could not be developed before perhaps 1990. As explained earlier, costs would be a factor which might seriously inhibit the development of the PERC and GENIE systems.

Glideway Stytem - As part of the analysis of the Northeast Corridor transportation problem the Massachusetts Institute of Technology has also proposed the Glidewav System, intended to provide high-speed door-to-door passenger service both between the various cities in the Northeast Corridor, and within the communities which comprise the corridor. The problem was approached as a problem in systems analysis, but some preliminary specification of rights of way and vehicles has been attempted. The ground effect would be employed; i.e., the vehicles would ride on an air cushion between the vehicle and the private right of way. Viewed as a system, the right of way would consist of a main line which could provide essentially nonstop high speed transportation between pairs of cities in the Northeast Corridor; and would be supplemented by secondary loops within the larger communities (essentially the Standard Metropolitan Statistical Areas). Flexibility coupled with adherence to frequent high speed service would be obtained by the use of several different models, each capable of riding on all of the system's lines: six-passenger capsules, larger capsules carrying approximately 40 passengers (bus type vehicle), and individual car carriers, for those who wish the use of their automobile at the end of the trip. Speeds on the main line would be 350 mph, and 150 in the secondary loops. Switching would be mechanical, propulsion systems would employ the linear induction motor.

It has been assumed in the MIT study that by proper planning it would be possible to begin design and construction of the system by 1975. This estimate appears to be overoptimistic and it is unlikely that a start could be made before 1980-1985.

Economic Aspects: Crude calculations based on assumed passenger volume level and investment costs indicate that the per passenger cost of riding 6-passenger capsule or bus-type vehicle would be competitive in out-of-pocket terms with the costs of riding present-day buses between Boston and Washington. These calculations appear to be overoptimistic, in part because an unrealistically low rate of interest for construction bonds has been assumed (4%), in part because apparently no account has been taken of probable price rises into the future. It should also be noted that the calculated advantage disappears, as is only to be expected, when short trips costs are examined.

E. Public Right-of-Way Transportation and Mixed Public and Restricted Rights of W

Electric Automobile - More or less in the spirit of physical systems design are a number of proposals to apply a systems approach to the use of specific vehicles. A number of these have already been discussed: the Urbmobile, the Rrollway, the StaRR car. Recently, the electric automobile, which had been popular in the early days of horseless carriages, has been re-examined with the aim of using it to replace the automobile as a "mass-transportation" device.

These reexaminations have followed two lines: one has been to view the electric automobile as a low-powered low-capacity vehicle which could be used only within a limited radius, and possibly as a part of a manual-plus-automated mode of transportation in which the electric vehicle would be coupled to a guideway and ride into the center of the city on an automated guideway. The other has been to consider the electric vehicle as a competitor of the gasoline-powered automobile. Both lines of attack have had to depend heavily on the development of a suitable battery.

When the electric automobile is viewed as a low-speed suburban or suburban-urban means of transportation, the vehicle itself is relatively small, and the battery occupies relatively little space. There are indications that such batteries will be available shortly and that the small electric-powered vehicle will be a reality well before 1975. Ranges of operation are expected to be about 50 miles during the initial years, to rise to perhaps 200 miles within eight to ten years. The possibility has been discussed of standardizing battery design and simplifying battery connections so that a driver would be able to enter a service station and replace his run-down battery with a fully recharged battery in about the same time that it now takes to fill a gasoline tank.

The General Motors Corporation has adopted another approach -- that of providing an electric automobile with performance characteristics equalling those of the present day automobile; i.e., acceleration, braking, springing, were to simulate present performance levels. Such an automobile, called the Electrovair, was constructed by General Motors, using a Corvair body and substructure. The weight of this vehicle exceeded that of the conventional Corvair automobile by 800 pounds, and the entire trunk space was used to house the 530-volt silver-zinc battery, which provided the energy for the 14000 rpm squirrel-cage motor. While the weight of the motor was low (130 pounds), the weight of the modulating inverter assembly and control and cooling systems brought the total weight of the motor system to 550 pounds. Range of operation of this car is 40-60 miles , depending on accelerations and grades on which the car travels.

It is clear that at the present time, at least, the electric automobile cannot be a true competitor of the gasoline powered car. Lack of luggage room, high weight, need of special equipment to recharge batteries of this type, cost, and other factors such as complexity of electric circuits would appear to rule out the possibility of large-sized electric automobiles by 1975. In addition, even after a number of technical problems which are raised above have been solved, the need to provide rapid battery charging or quick battery changing would seem to militate against the rapid spread of the full-sized electric automobile.

Economic Aspects: Various preliminary studies would seem to indicate that the operating costs of the smaller electric vehicle would be competitive with those of the gasoline vehicle. It should however be borne in mind that a large part of the purchase price of gasoline (and diesel fuel) is represented by Federal and State taxes. A sizable increase in the number of electrically powered vehicle might well reduce such tax income and eventually lead to taxation of electric batteries or of the electric power used to charge them, and thereby alter competitive relationships.

Combination (electric-gasoline) Vehicles - These have been proposed partly out of a desire to reduce air pollution. In vehicles of this type, the main source of motive power would be the electric battery, with a gasoline engine providing standby power for such purposes as hill climbing, rapid acceleration (particulary important for buses with their heavy loads). It appears fair to say that there is no great technological problem which would militate against their manufacture even at the present time, once the electric battery is improved as noted above. Whether they will in fact be built will be determined by the interplay of public interest in preventing pollution and the profitability of producing such vehicles.

F. Air Transportation

V/STOL's - As has been noted previously, the jet airplane achieves maximum economy at city-pair distances greater than approximately 500 miles. Such jets are however currently used over shorter distances at which the train or the automobile begins to be competitive with the plane in terms of door-to-door time. Since much emphasis has been placed on high speed ground transportation in the various corridors within the nation in which distances between the ends of the corridor are 500 miles or less (e.g. the Northeast Corridor, the Keystone Corridor, the San Francisco-Los Angeles Corridor); and since increases in ground speeds may provide newer forms of ground transportation with a time advantage over short-haul air transportation, a number of proposals have been made to develop a family or families of air transport vehicles which would be competitive with future ground transportation on the counts of both speed and economy.

A number of low-capacity models of either vertical or short take off and landing planes which are intended to fill this need have been built and tested for military purposes: e.g., a deflected-slipstream STOL, the Breguet 941/McDonnell 188 E; a folded rotor VTOL, the Lockheed Cheyenne; a tilt-wing VTOL, the XC-142A. A lift/cruise fan VTOL has also been designed. These planes would require shorter runways than the present jets, i.e., approximately 3000 feet for planes with passenger-carrying capacities in the neighborhood of 90-120 persons.

The operational advantages of such craft are: they can take off from and land in a greater number of airports than can the conventional jet; they require smaller landing approach and take-off patterns, and hence are capable of using air space not required by or available to higher-speed planes, thereby reducing both traffic control problems and time lost in maneuvering, with attendant important reductions in block time and direct operating costs over relatively short distances; they can land at lower ceilings and poorer visibility, thus allowing lower minimums under instrument flight rules.

Technical Feasibility: A long period of testing and design has gone into the production of the military versions of these craft which, as has been stated, are smaller than comparable civilian craft in economically viable sizes would be. Even at present, not all of the military craft problems, including that of reliability, have been solved. To expand the design to the larger sizes, to test and improve these units, and to produce them, to effect the changes in instrument flying and landing, to reduce noise to acceptable levels, to improve stability and damping to acceptable levels, would probably require another six to seven years; however, at least one craft should be ready to fly by 1975. The full economic impact of such planes could however be felt only when the supporting airports are built. Allowing a 10-year span for this purpose, it is not likely that V/STOL craft will have much of an impact before 1980.

Economic Aspects: A careful study of the economic aspects of aircraft for intercity short-haul transportation was conducted by the McDonnell Aircraft Corporation for the FAA. The San Francisco-Los Angeles corridor was used for simulation. Since the study investigated the short-haul problem, one of the important parameters which underlie it is the use of short-runway relatively centrally located airports. These are considered essential if the door-to-door service times offered by such aircraft are to be competitive with future high-speed ground transport. This raises the questions of noise and safety not only in the obviously social and physical, but also in the economic form. For example a plane which crashes into a city street can have serious financial consequences, hence insurance costs are likely to be high for such craft. In addition, the costs of bringing the airport near the city center will be high. The fear of accidents may also militate against the granting permission to build such airports.

The estimates which have been prepared for the fares in the San Francisco-

Los Angeles corridor show them to be somewhat higher than comparable airline fares, the premium amounting to from a few pennies to as much as $3.39 for the approximately 400 mile run, for one of the types studied.

Helicopters - At the present time, some preliminary design work has been done on helicopters which would be capable of performing the same type of service as the V/STOL craft, namely, providing short haul air service between points 200 to 400 miles apart. Preliminary calculations indicate that the economics of a helicopter carrying approximately 90 to 100 passengers would be the same as those indicated above--namely, premium fares would have to be charged for such runs. These fares would however be competitive with plane+taxi costs. Again, the success of the helicopter service would depend on providing in-city airports. Such craft could be ready for use by approximately 1975 or shortly thereafter if the go-ahead signs were given now.

Dirigibles - These have not figured in discussions of air transport in the United States They are mentioned here only because they have been used in Russia to transport heavy equipment to construction sites.

The SST - It would appear that the supersonic craft will not be an important factor by 1975, even though a few Concordes may be flying out of Philadelphia International Airport by then. Numerous technical problems have had to be faced, but considerable Federal funds have been pumped into the program (approximately $1.3 billion according to one estimate) and work is far advanced. The most important questions which these long-range craft rise for the Commonwealth of Pennsylvania are related to supersonic boom and the location of an airport to handle these craft.

Airports and Heliports - The newer aircraft create problems at the airport. Instrument landing systems will need to be drastically improved to handle the new V/STOL craft on very short headways. The introduction of the stretch jets, and convertible cargo-passenger craft like the Boeing 747 are creating problems of handling the larger volumes of passengers and cargo that will arrive in any one given craft. Numerous studies are under way by the airlines and aircraft manufacturers. These will employ computerization and containerization to speed handling of people and goods. Fast handling will be aided by the introduction of high-speed loading and unloading equipment at the airports. The equipment that was capable of unloading a 90,000 pound payload in 22 minutes in 1966 is being improved further, and new systems such as passenger/cargo loading elevators, and mobile lounges have been designed. Three or four such units could load a Boeing 747 plane in about 7 minutes.

Among various ideas being considered to improve all-around capacity of an airpo to handle the traffic are circular runways, which reduce the length of runway requir for takeoff or landing, regardless of type of plane, and which improve stability dur the process; ATOL, which would be a land-based version of the take off and landing equipment used on board aircraft carriers, and which likewise would reduce the distance needed for present commercial aircraft to 5300 feet. Advantages include improved safety, while the disadvantages are chiefly the need to modify existing aircraft to accommodate the towing and arresting gear, and the high operating cost of such equipment. Such equipment, if proven to be economically sound, could bring even the large jets into the cities, provided that other objections to such moves can be met. Small in-port transit vehicle systems have also been proposed, and some are currently in the testing stage. These vehicles would help move the passengers with their luggage at relatively high speeds from one part of the airport to another. Previously mentioned in this report is the Teletrans system, which is being studied in Detroit. The Houston airport is also to be equipped with a system designed to accomplish the same ends.

Considerable attention has also been paid to the feasibility of providing high-speed rail service from city center to airport. Such a move is under way in Cleveland . Other cities such as New York and Philadelphia are considering it. Whether such a service would be economic is a matter for specific study in each locality.

The ACV (air cushion vehicle) has been used in a number of selected locations, notably in the San Francisco Bay area, to provide high speed over-water transportation from the city to the airport. Helicopters have been used to fly passengers from the roof of the PanAm building in Manhattan to Kennedy airport in Queens. Both methods have proven expensive, and the impression given in the literature is that the costs per passenger mile will tend to be greater for the ACV ferries.

G. Waterways.

Vehicles – Most of the progress in this field has been evolutionary. Ships and barges have been made larger and faster, attempts have been made to introduce containerization wherever feasible, particularly loading and unloading of cargo from ocean-going vessels. Some consideration has been given to the development of atomic power plants for propulsion.

Among the more revolutionary innovations are Hovercraft, a British ACV used as a ferry on the Solent run between the Isle of Wight and the mainland, and hydrofoils, or craft which skim along the surface of the water. Vessels of this type are capable of speeds of more than 70 knots, although most hydrofoil vessels have a cruising speed of 40 knots. Although it is planned to introduce a Hovercraft ferry on the Channel run (the vessel has already had its trial runs), there is a widespread view that these vellels are currently not sufficiently reliable and economical for use where existing transportation of a mre conventional kind is available. It is generally considered tha such vessels might be profitably employed to traverse marsh lands or used in similar situations where the cost of laying a railroad track or building a road might be excessive. Such vessels are at present sufficiently well advanced in their technology to permit their use in situations where high reliability is not too important and where other modes of transportation may, because of particular economic circumstances, be costly.

H. Pipelines

Long distance transportation by pipeline has been traditionally reserved for natural gas, crude petroleum, and petroleum products. Pipelines have also been employed in special situations for the transport of various slurries, as well as for clay, sand and gravel, ores, phosphates, gilsonite, etc. Recent trends have been towar the increasing use of pipelines to carry such materials as phosphates, fertilizer, cement materials, and coal. The rationale behind such use of pipelines is that the first-named materials must in any event be ground down to fine particle sizes before use. The rationale for coal transport in this form is not as clear, since it would be necessary to employ special burners capable of burning it in the form of a very fine suspension. Such burners are currently available.

Experiments have also been conducted on the use of capsules, tightly sealed, to carry materials along with the liquids which are being transported. Numerous problems would have to be solved to make this method technically feasible, among them the need to have the capsules bypass puming stations.

Current progress in pipeline technology include the use of plastic materials, longer pipeline sections, and at-the-site welding. It cannot however be said that any radical cost-reducing solutions are being offered, which would make pipelines more attractive in terms of their economics. There is widespread feeling among knowledgeable persons in the field of transportation that pipelines are justified only to meet special needs; when these special needs are recognized and acted upon by the other transportation modes, the pipeline may well become uneconomic to operate. Thus, the unit train has displaced the pipeline from the coal-transportation field. The large oil tanker can transport petroleum products between seaports more cheaply than this can be done by pipeline.

It may however be the case that if capsule pipeline transportation is developed to the point that relatively high-value products can be transported in capsules as a byproduct of the principal task of transporting a bulk material, then the pipeline may in certain areas emerge as an important competitor of other transportation systems. It does not appear likely that sufficient research will have been conducted to bring capsule transportation to this point by 1975.

I. Ancillary Technologies

Implicit in many of the proposals which are being advanced in the general sphere of transportation are certain technological advances that would enable the innovations embodied in these proposals to operate. Among these advances which have been mentioned in the literature is the fuel cell. Such a cell would, if produceable in the proper sizes, weights, and costs, be suitable as a source of motive power for the electric automobile. One of the important by products would, of course, be a reduction in emissions of unburned hydrocarbons due to incomplete combustion of motor fuel.

While only two or three years ago the fuel cell was being viewed hopefully, the current concensus is that, within the foreseeable future, the fuel cell will not be usable as a mobile source of power. The reasons are: heavy weight, high cost, and the problem of the safe transport of the extremely active hydrazine, which is at present the main combustible employed in fuel cells.

Among other advances on the fringes, so to speak, of transportation technology are "whisker" technology, microwave power transmission, and advances in computer hardware. The first of these will provide light-weight high strength materials. Use of such materials may make it possible to produce stronger and lighter weight vehicles, and so make higher ground speeds more feasible. Microwave power transmission may become a possibility as a means of providing electric energy to high-speed tube-enclosed vehicles particularly since catenary-pantograph systems require much improvement if they are to be used at high (200+ mph) speeds. Further advances in computer hardware will make it possible to install rugged and reliable light weight computers on board high speed ground vehicles and possibly simplify command, control, and routing.

The new laser beam technology will in all likelihood play a role in future transportation systems. Two uses are currently being envisaged for it. One would be in the field of communication as part of the broader problem of control and scheduling. The other possibility being currently mentioned is its use in tunnel boring, where laser beams are expected to cut costs of drilling through rock. In fact, reduction in tunneling costs is a sine qua non for some of the advanced high speed ground transportation proposals like the Edwards gravity vacuum tube, and to a lesser extent for some of the alternatives being investigated for use in the Northeast Corridor.

Lastly, communication and control technology have advanced to the point that electronic driver aid and information systems (GM's DAIR) could be installed along highways and in cars; these would provide road-condition information. It would also be possible to install under-road cables in reserved automatic-mode highway lanes which would permit the car to operate at high speeds. There still remain numerous problems to be solved with respect to this last development, including, above all, safety. However, both systems mentioned above could be operational by 1975 through the provision of a suitable level of developmental effort.

CONCLUSIONS & RECOMMENDATIONS

The conclusions and recommendations presented below are based on the following considerations:

1. Other studies performed under this contract indicate that there will be no important intercity transportation bottlenecks other than highways in Pennsylvania by 1975. Urban transportation does, however, require much attention and effort.

2. A state-level DOT cannot directly force-feed technological development in transportation, partly because of lack of funds, and partly because technology so obviously transcends state lines. It can however influence the direction and rate of technological advance through representations which would be made at the national level. These representations would of course need to be based on a thorough understanding of which areas are of high importance to the state and the nation.

A study of the literature summarized in the preceding pages, together with the statements made by various authorities in transportation, lead to the following conclusions and recommendations.

1. The most troublesome area in transportation, i.e., the area with the greatest immediate problems, is that of urban transportation. Both the current state of the art and economic and social considerations lead to the recommendation that the state DOT emphasize solutions which are based on scheduled types of transportation as distinguished from random-demand types.

2. The costs of providing new capacity particularly in urban transportation may well be so high, even aside from the long-term trends in costs, that

either fare increases will be needed to cover them, or else the deficits will be met from other funds. This statement is made in full recognition of the following cost-reducing factors: (a) decline in the number of vehicles (and hence in investment) required to meet a given level of demand as the average speed on a line increases; (b) reduction is the number of direct operating personnel for the same reason; (c) further reduction in direct labor resulting from elimination of jobs due to automation; and (d) the existence of a number of studies which indicate, for certain specific proposals, fares that are competitive with existing fares.

The above conclusion takes into account that: (a) the average distance traveled in urban systems increases with added capacity; (b) the improvements in speeds of urban transportation modes are comparatively much lower than can be anticipated for inter-city travel; (c) proposals to abolish jobs can run into severe opposition; (d) it is probable that maintenance and safety personnel increases would offset much of the operating personnel reduction.

It is therefore recommended that a thorough review be made of cost factors that have been published for a number of proposed urban transportation systems so that the DOT can set policy with respect to the nature and amount of aid to be provided for urban transportation.

3. As part of the above process, or parallel with it, attention should be focused on the technological aspects of:

(a) The NTL or New Tokaido Line, with special reference to track maintenance, comfort, automatic routing and control, and power transmission.

(b) Similar aspects, where and when applicable, of the Boston-to-Washington trains and the new equipment on the Canadian National Railways.

4. Close watch should be kept on a number of European developments through systematic coverage of non-English sources. While the French Aerotrain and the British Hovercraft have received attention in the U.S.A. literature, coverage of other developments, some of which may prove of high importance within the next ten years, has been far from adequate.

5. Continuing surveillance of the rates of advance being registered in the development of the various items and systems described in the report, together with any new proposals in the field of transportation. Such surveillance would enable the state DOT to reappraise its own position from time to time, based on whatever new information is acquired. Some initial guidance on probabilities of introduction of new technologies in a commercial environment is provided in Table A-1.

TABLE A-1

PROBABLE TIMES OF INTRODUCTION OF NEW TRANSPORTATION TECHNOLOGY

Technology	*Probability 1/*	*Earliest Date 1/*	*Implications*
Trains at speeds up to 160 mph		Now available	In the Northeast Corridor: Eventual growth in the proportion of railroad passenger traffic to total such traffic. Increased safety due to elimination of grade crossings and provision of protection against vandalism. General: A possibility of recapturing passenger movement distances of 100-500 miles lost to other modes.
200-mph locomotives	Poor	1980	Would be used in intercity travel 100-500 miles.
The Rrollway	Poor	1985	Proportionately less automobile traffic on the highways. Potentially, elimination of the passenger railroad service along competing routes.
The linear induction motor	Very high	1975	Would be available primarily for new high-speed ground transportation systems, once electric power transmission problems are solved.
The gas turbine		Currently available	Capable of being introduced widely into (a) high-speed rail lines; (b) commuter systems; (c) truck tractors. Should increase passenger traffic on intercity and commuter railroads, but may create additional competition between trucks and railroads for cargoes.

Technology	*Probability 1/*	*Earliest Date 1/*	*Implications*
Automatic routing, command, and control systems:	High		
A. Existing mass transit systems			
1. At present speeds		Currently available	Reduction in manpower requirements for operating personnel. Increased manpower requirements for maintenance and passenger safety. Should attract additional passengers to urban and commuter lines through improved service and safety.
2. At 100 mph speeds		1972-1973	Same as above.
B. Existing Intercity systems at 100-150 mph speeds		1975-1976	Will require prior improvements in road beds and radii of curves, protection against weather and vandalism; elimination of grade crossings.
C. Future high-speed systems		1985-1990	One of the most important features of such systems, without which these cannot be successfully operated.
Faster movement of freight		Currently available	For the railroads, the key is believed to reside in the acceptance of the use of shorter freight trains and the unit trains coupled with applications of systems science. For the truckers, the economically sound expansion of route lengths may become possible through use of the gas turbine. For waterways and airlines——sizes and speeds of vessels and unloading facilities are being increased. Centers for integrating movement and transfer of freight between modes are being proposed.

Technology	*Probability 1/*	*Earliest Date 1/*	*Implications*
Vehicles for high-speed ground transportation:			
A. Aerotrain	Good	1970-1972	A successful operation in France could pave the way for its introduction here, provided the noise problem is solved.
B. Hovertrain	High	1977	This is basically a variant of a ground effects machine and could prove competitive with the Aerotrain.
C. Hovair	Good	1980	The chief problems to be solved are the provision of guideways and propulstion units at competitive costs.
D. Levacar		Currently available	This system evidently proved economically unacceptable to the transportation industries in the early 1960's. If costs can be reduced, it would be suitable for high-speed ground transportation.
E. Tubeflight	Fair	1985+	Potential use in both mass transit systems and intercity systems.
F. Gravity - Vacuum	Fair	1990+	Would require prior development of accurate and inexpensive tunnel boring and tube laying techniques.
The magnetically suspended train	Fair	1990	Unlikely to be of importance since it does not appear to provide a technologically attractive means of reducing train friction.

Technology	*Probability 1/*	*Earliest Date 1/*	*Implications*
High-speed "conventional" commuting systems and mass transit systems		Currently being built in a number of cities	Reduction in automobile travel to city centers; reduction of center city congestion; reduction in need need for additional freeways and expressways.
The Skybus	Very high	1975	Useful high-speed high-service level mass transit in cities of moderate size.
Minibus-jitney services		Currently available	Would provide service in areas in which mass transit systems are not viable at current fares.
The StaRR Car	Fair	1980	Would provide flexible and frequent but high-cost transportation from suburbs to city centers in the morning and back to suburbs at night. Would not provide sufficient capacity for reverse travel directions and would be costly for the low income family.
Rail Bus		Currently available	Will reduce peak-hour commuting times through judicious combinations of highway and railroad track; should promote commuter shifts from automobile to mass transit through increased convenience and through-service.
Monorails		Currently available	Useful loop systems for city-suburban and similar use.
The Larson System	Fair	1990	Would create service bottlenecks at events attracting large numbers of people; would be a high-cost mass transit system.

Technology	*Probability* 1/	*Earliest Date* 1/	*Implications*
The Urbmobile	Fair	1985	Would create center-of-city bottlenecks due to need for mass city-center parking garages.
Teletrans System	High	1975	Useful for intra-airport transportation of passengers and luggage.
Automatic Taxi Train	Good	1985	If economically sound, could provide mass transit for peak hour requirements of about 5-6,000 passengers per hour.
Integrator	Good	1985+	Center-city high-speed mass transportation.
Lewis Moving Pavement		Currently available	Would provide faster movement of persons in city centers, but would not be usable by the handicapped individual
Lewis Never-Stop Railway		Currently available	Usable as a moderate-speed center city loop system; not suitable for handicapped individuals.
Telecanape		Currently available	Usable as a moderate-speed center city loop system; not suitable for handicapped individuals.
Passenveyor-Horizontal	Good	1980	Usable as a moderate speed high-volume center city loop system.
SCAT System	Fair	1990	Would create service bottlenecks at events attracting large numbers of people; would be a high-cost mass transit system.
PERC System	Fair	1990	Economically costly because of the need to provide large numbers of small vehicles; provides very high flexibility but would create bottlenecks at mass events.

The GENIE System	Poor	1985	High cost service in suburban areas.
The Transgrid System		Currently available	It is now available in the sense that it provides a set of generalized rules well suited to the design of mass-transit systems in cities currently not possessing any. Combindes flexibility and adaptability.
The Glideway System	Good	1990	An important approach to the organization of new ground transportation planning in a corridor. Could improve speed and safety of passenger travel on the ground and free the airlines to concentrate on the longer distance routes.
The "small" electric automobile	Very high	1972	A limited-range second or third family car useful for limited shopping trips, social trips, etc., in which neither distance nor speed play an important role. Would reduce air pollution.
The "large" electric automobile	Good	1978-1980	Could become an important competitor of the gasoline powered car and possibly reduce air pollution.
Combination (electric-gasoline) vehicles	Good	1980	Would reduce air pollution.
V/STOL's	High	1975	Most useful as a mode coordinate with high speed ground transportation. Requires noise level improvement.
Large helicopters (90+ passengers)	Good	1980	Most useful for shorter inter-city travel in the range of 150-250 miles.

Technology	*Probability 1/*	*Earliest Date 1/*	*Implications*
The SST	Very high	1975	Considered to be a high-cost limited demand craft which will create sonic boom problems and problems of airport location.
Changes in airport design and operation			
A. Instrument landing systems	Very high	1975	Will be required for successful operation of V/STOL craft.
B. Automation of and improvement in passenger and cargo handling		Currently available	Will reduce waiting times at airports even when the larger craft are used.
C. New runway design	Good	1980	Would permit use of shorter runways and require less land.
D. ATOL (assisted take-off and landing)	Good	1980	Would permit use of shorter runways and require less land.
Hovercraft ferries and ships		Currently available	Increase speed of travel over water and provide greater comfort. Likely to be expensive.

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APPENDIX B

TRANSPORTATION-RELATED FUNDING PROGRAMS OF U.S. GOVERNMENT AGENCIES

Introduction

The Federal Government provides technical and financial assistance to states and their political subdivisions and to transportation organizations for the development of facilities, equipment, techniques, and methods to improve all types of transportation. The Federal Government encourages the development of transportation systems on an areawide basis and has given increased attention to the social impact of changes in transportation systems.

The federal funding programs described in Appendix B are those which may have a significant impact on the plans and budgeting of a PennDOT. With this in mind, an analysis was made of the nature of the funding programs in relation to the specific projects and programs which were listed for consideration by a PennDOT in Section III of this report (Table 3-1). The identification of the sources of federal funds which appear in the following table (Table B-1) resulted from this analysis. Tables B-2 and B-3 give some specifics on airport improvement projects in Pennsylvania which are on record as having high priority for funding by the U.S. Department of Transportation and the U.S. Department of Commerce respectively.

TABLE B-1

POSSIBLE SOURCES OF FUNDS FOR PENNDOT ACTIVITIES

Program or Project Evaluated for PennDOT	Component Number	Corresponding Federal Progra Reference (page number)
Intercity Railway Improvements		
Keystone Corridor	R-1 to R-11	B-25
Harrisburg to Philadelphia High-Speed Rail	R-12	B-25
Railroad Terminal Construction	R-13 to R-17	B-25, 40, 41
Intermodal Freight Forwarding Terminals	R-18 to R-22	B-31, B-33
Grade Crossing Safety Improvements	R-23	B-25, B-27
Northeast Corridor Track Improvements and Connections	R-24	B-25
Urban Commuting and Metropolitan Transportation		
Hovercraft on Rivers	U-1	B-40, 41, 42
Urban Inter-Terminal Connections	U-2 to U-3	B-40, 41, 42, 43
Demonstration of Electric Cars	U-4	B-40, B-42
Rail Bus Demonstration	U-5	B-40, 41, 42
Aerial Tramway Construction	U-6	B-40
Subsidize Commuter Transportation	U-7	None
Transit Re-equipment	U-8 to U-11	B-40, B-41
Study Alternative Urban Transportation Improvements Possibilities	U-12	B-40, 41, 42, 43

Program or Project Evaluated for PennDOT	Component Number	Corresponding Federal Program Reference (page number)
Jitney Service	U-13	B-38, 40, 42
Survey Availability of Right-of-way	U-14	B-40, B-41
Extension of Existing Mass Transit Lines	U-15 to U-16	B-40, B-41
Purchase Skycrane Helicopter	U-17	B-40, B-42
Study Controversial Urban Freeways and Access Tunnels	U-18 to U-19	B-27
Skybus Demonstration	U-20 to U-21	B-42
Construction of Parking Facilities	U-22 to U-25	B-40, 41, 43
Helicopter Rescue Service	U-26	B-29
Exclusive Bus Lanes	U-27	B-27, 28, 42
Intercity Highway Construction		
New Highway Construction, Relocation and Improvement of Existing Roads	H-1 to H-2	B-24, B-27
Release of State Roads to Local Authorities	H-3	B-28
Safety Improvements	H-4 to H-6	B-27
New Highway Planning	H-7	B-27, B-28
Electronic Merge Signals	H-8	B-27, 28, 29
Automatic Truck Weighing Devices	H-9	B-27, B-29
Industrial Development Support		
Emergency Fund for Industry Supporting Transportation Activities	I-1	B-24, B-33

Program or Project Evaluated for PennDOT	Component Number	Corresponding Federal Prog Reference
Improve Cargo Handling at Pennsylvania Ports	I-2 to I-6	B-31, B-33
Lake Erie to Ohio River Canal	I-7	B-50
Channel Dredging	I-8	B-50
Foreign Trade Zones	I-9	No funding, but helpful assistanc can be obtained from the Foreign-Trade Zones Board of the U.S. Department of Commerce
Survey and Enlarge Clearances	I-10	B-27, 49, 50
Airport Access and Facilities Improvements		
Promotion of International Flights	A-1	B-40
Heliport and STOL Airport Development	A-2	B-22, 35, 40, 53, 58
Ground Transportation to Airports	A-3 to A-4	B-40, 41, 42
Airport Terminal Requirements	A-5	B-40
General Aviation Airport Improvements and Additions	A-6 to A-7	B-22, 35, 40, 53, 58
Tourism and Recreation		
Improve Access to Tourism and Recreation Areas	T-1 to T-3	B-24, 26, 33, 46, 47, 53
Waste Disposal		
Dispose of Channel Dredgings	W-1	B-31, 33, 49, 50
Disposal of Household and Industrial Wastes	W-2 to W-3	B-40, B-44

Program or Project Evaluated for PennDOT	Component Number	Corresponding Federal Program Reference (page number)
Administration, Legislation and Regulation		
Regulate Multi-bottom Trailers	L-1	B-60
Assist PUC and ICC	L-2	B-60
Change General Order 29	L-3	None
Regulate Movement of Hazardous Materials	L-4	B-27, 29, 60
Electronic Monitoring on Highways	L-5	B-29, B-60
Reduce Air Pollution	L-6	B-36
Reduce Noise Associated with Vehicles and Airplanes	L-7	B-22, 26, 27, 40
Amend Certain Portions of the Pennsylvania State Constitution	L-8	None
General Development		
"New City" Development	G-1	B-24, 27, 28, 39, 40, 43
Emergency Planning Funds	G-2	None

Table B-2

The FAA Airport Plan For Pennsylvania

PENNSYLVANIA						
COMMUNITY AND METROPOLITAN AREA	AIRPORT NAME * If Federal Agreement	AIRPORT DATA				RECOMMENDED DEVELOPMENT
		SITE STATUS	KIND OF AIRPORT	CONGESTION RELIEVER	RECOMMENDED RWY LENGTH (100s of Ft.)	
ALLENTOWN (ALLENTOWN-BETHLEHEM-EASTON)	*ALLENTOWN BETHLEHEM EASTON		TR		66	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, WIDEN TAXIWAY, EXTEND RUNWAY AND TAXIWAY, INSTALL (AND/OR EXTEND) HIRL AND MIRL, IN-RUNWAY LIGHTS, OBSTRUCTION REMOVAL AND RELOCATE NAVAIDS, MITL.
ALLENTOWN (ALLENTOWN-BETHLEHEM-EASTON)	*ALLENTOWN QUEEN CITY MUNICIPAL		GU		40	STRENGTHEN APRON, TAXIWAY AND RUNWAY, MISCELLANEOUS.
ALTOONA (ALTOONA)	NEW		GU		39	CONSTRUCT NEW AIRPORT.
ALTOONA	(SEE MARTINSBURG)					
ANNVILLE	MILLARD	P-SU	B1		27	DEVELOPMENT PENDING SITE DECISION.
BEAVER FALLS (PITTSBURG)	*BEAVER COUNTY		LG	YES	47	FIRE AND RESCUE BUILDING.
BEDFORD	NEW		GU		41	CONSTRUCT NEW AIRPORT.
BERWICK	BERWICK	P-SU	B1		27	DEVELOPMENT PENDING SITE DECISION.
BETHLEHEM	(SEE ALLENTOWN)					
BLOOMSBURG	*BLOOMSBURG MUNICIPAL		B2		32	LAND FOR CLEAR ZONES, CONSTRUCT TAXIWAY, WIDEN TAXIWAY AND RUNWAY, EXTEND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, OBSTRUCTION REMOVAL, MITL.
BRADFORD	*BRADFORD-MC KEAN COUNTY		LO		75	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, WIDEN RUNWAY, EXTEND RUNWAY, STRENGTHEN APRON AND RUNWAY, INSTALL (AND/OR EXTEND) HIRL AND MIRL, MITL, FIRE AND RESCUE BUILDING AND EQUIPMENT MAINTENANCE BUILDING, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
BRISTOL	(SEE LANGHORNE)					
BUTLER	*BUTLER-GRAHAM		LG	YES	47	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, EXTEND APRON AND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, MITL, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
CARLISLE (HARRISBURG)	CARLISLE CITY	P-SU	B2		32	DEVELOPMENT PENDING SITE DECISION.
CHAMBERSBURG	NEW		B1		27	CONSTRUCT NEW AIRPORT.
CLARION	NEW		B2		35	CONSTRUCT NEW AIRPORT.
CLEARFIELD	NEW		B2		39	CONSTRUCT NEW AIRPORT.
CLEARFIELD	(SEE PHILIPSBURG)					
CLIFFORD (PHILADELPHIA)	CARBONDALE-CLIFFORD	P-SU	B1		29	DEVELOPMENT PENDING SITE DECISION.
COATESVILLE (PHILADELPHIA)	*CHESTER AREA COUNTY		LG		46	LAND FOR CLEAR ZONES, MISCELLANEOUS.
COLLEGEVILLE (PHILADELPHIA)	PERKIOMEN VALLEY	P-SU	B2		32	DEVELOPMENT PENDING SITE DECISION.
COLUMBIA (LANCASTER)	MC GINNESS	P-SU	B1		26	DEVELOPMENT PENDING SITE DECISION.
CONNELLSVILLE	*CONNELLSVILLE		LG		47	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, EXTEND RUNWAY AND TAXIWAY, INSTALL (AND/OR EXTEND) MIRL, MITL, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
CONWAY (PITTSBURG)	NEW		B2	YES	33	CONSTRUCT NEW AIRPORT.
CORRY	*LAWRENCE		B2		37	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, WIDEN RUNWAY, EXTEND APRON AND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, MITL, MISCELLANEOUS.
COUDERSPORT	POTATO CITY		B2		40	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT APRON, TAXIWAY AND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
DANVILLE	DANVILLE	SU	B1		26	DEVELOPMENT PENDING SITE DECISION.
DOYLESTOWN (PHILADELPHIA)	*CENTRAL BUCKS COUNTY		GU		37	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, WIDEN RUNWAY, EXTEND APRON AND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, OBSTRUCTION REMOVAL.

Source: National Airport Plan, FY 1968-1972, U.S. Department of Transportation, FAA, 1967

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The FAA Airport Plan For Pennsylvania

PENNSYLVANIA						
COMMUNITY AND METROPOLITAN AREA	AIRPORT NAME * If Federal Agreement	AIRPORT DATA				RECOMMENDED DEVELOPMENT
		SITE STATUS	KIND OF AIRPORT	CONGESTION RELIEVER	RECOMMENDED RWY LENGTH (100s of Ft.)	
DU BOIS	*DU BOIS-JEFFERSON COUNTY		LO		55	WIDEN RUNWAY, EXTEND RUNWAY AND TAXIWAY, INSTALL (AND/OR EXTEND) HIRL, MITL, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
DUNCANNON	NEW		B1		27	CONSTRUCT NEW AIRPORT.
EAGLES MERE	*EAGLES MERE MUN		B1		30	CONSTRUCT APRON, TAXIWAY AND RUNWAY, OBSTRUCTION REMOVAL.
EAST STROUDSBURG	HAMLEN	P-SU	B1		26	DEVELOPMENT PENDING SITE DECISION.
EASTON	EASTON	P-SU	GU		37	DEVELOPMENT PENDING SITE DECISION.
EASTON	(SEE ALLENTOWN)					
EBENSBURG	*EBENSBURG		B2		38	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, WIDEN RUNWAY, EXTEND APRON AND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, MISCELLANEOUS.
ELIZABETHVILLE	NEW		B1		27	CONSTRUCT NEW AIRPORT.
EMLENTON	*EMLENTON MUNICIPAL		B2		35	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT APRON, TAXIWAY AND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, RELOCATE NAVAIDS.
EMPORIUM	NEW		B2		33	CONSTRUCT NEW AIRPORT.
ERIE (ERIE)	*PORT ERIE		LO		60	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, EXTEND TAXIWAY, INSTALL (AND/OR EXTEND) HIRL AND MIRL, IN-RUNWAY LIGHTS AND MITL, FIRE AND RESCUE BUILDING, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
FINLEYVILLE	FINLEYVILLE	P-SU	B2	YES	34	DEVELOPMENT PENDING SITE DECISION.
FORD CITY	(SEE KITTANNING)					
FRANKLIN	*CHESS-LAMBERTON		LO		55	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, WIDEN RUNWAY, EXTEND RUNWAY, INSTALL (AND/OR EXTEND) HIRL, MITL, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
GALETON	(SEE COUDERSPORT)					
GETTYSBURG	DOERSONS	P-SU	B2		32	DEVELOPMENT PENDING SITE DECISION.
GREENSBURG	(SEE LATROBE)					
GREENVILLE	*GREENVILLE MUN		B2		40	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, EXTEND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, MITL, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
GROVE CITY	NEW		B2		35	CONSTRUCT NEW AIRPORT.
HALLSTEAD	ULCO	P-SU	B1		27	DEVELOPMENT PENDING SITE DECISION.
HANOVER	DEVENER	P-SU	GU		38	DEVELOPMENT PENDING SITE DECISION.
HARRISBURG (HARRISBURG)	*HARRISBURG-YORK STATE		TR		50	CONSTRUCT APRON AND TAXIWAY, INSTALL (AND/OR EXTEND) MIRL, FIRE AND RESCUE BUILDING.
HARRISBURG	(SEE MIDDLETOWN)					
HAZLETON (WILKES-BARRE-HAZELTON)	*HAZLETON MUNICIPAL		LO		58	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, WIDEN RUNWAY, EXTEND APRON AND RUNWAY, INSTALL (AND/OR EXTEND) HIRL, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
HERSHEY (HARRISBURG)	HERSHEY AIRPARK	P-SU	B2		32	DEVELOPMENT PENDING SITE DECISION.
HONESDALE	HONESDALE	P-SU	B1		28	DEVELOPMENT PENDING SITE DECISION.
HUNTINGDON	NEW		B2		33	CONSTRUCT NEW AIRPORT.
INDIANA	*INDIANA CO JIMMY STEWART FLD		GU		41	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, EXTEND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, MITL, MISCELLANEOUS.
IRWIN	(SEE JEANNETTE)					
JEANNETTE (PITTSBURG)	NEW		B2	YES	34	CONSTRUCT NEW AIRPORT.
JOHNSTOWN (JOHNSTOWN)	*JOHNSTOWN-CAMBRIA CO		LO		55	STRENGTHEN APRON, TAXIWAY AND RUNWAY, IN-RUNWAY LIGHTS, MISCELLANEOUS.
KITTANNING	NEW		B2		34	CONSTRUCT NEW AIRPORT.
KUTZTOWN (READING)	KUTZTOWN AIRPARK	P-SU	B1		26	DEVELOPMENT PENDING SITE DECISION.

Source: National Airport Plan, FY 1968-1972, U.S. Department of Transportation, FAA 1967

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COMMUNITY AND METROPOLITAN AREA	AIRPORT NAME * If Federal Agreement	AIRPORT DATA				RECOMMENDED DEVELOPMENT
		SITE STATUS	KIND OF AIRPORT	CONGESTION RELIEVER	RECOMMENDED RWY LENGTH (100s of Ft.)	
LANCASTER (LANCASTER)	•LANCASTER		TR		56	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, WIDEN TAXIWAY AND RUNWAY, EXTEND APRON, TAXIWAY AND RUNWAY, INSTALL (AND/OR EXTEND) HIRL AND MIRL, FIRE AND RESCUE BUILDING, OBSTRUCTION, REMOVAL AND RELOCATE NAVAIDS.
LANGHORNE (PHILADELPHIA)	•LOWER BUCKS COUNTY		LG	YES	42	NO DEVELOPMENT RECOMMENDED.
LATROBE (PITTSBURG)	•WESTMORELAND LATROBE		LG	YES	55	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY AND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, MITL, MISCELLANEOUS.
LEBANON	(SEE ANNVILLE)					
LEECHBURG	NEW		B2		33	CONSTRUCT NEW AIRPORT.
LEHIGHTON	•CARBON COUNTY		BI		27	CONSTRUCT TAXIWAY, EXTEND APRON, INSTALL (AND/OR EXTEND) LIRL.
LEWISBURG	(SEE MILTON)					
LEWISTOWN	*MIFFLIN COUNTY		B2		32	NO DEVELOPMENT RECOMMENDED.
MARIENVILLE	NEW		B2		35	CONSTRUCT NEW AIRPORT.
MARTINSBURG (ALTOONA)	•BLAIR COUNTY		LO		59	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, WIDEN RUNWAY, EXTEND RUNWAY, STRENGTHEN RUNWAY, INSTALL (AND/OR EXTEND) HIRL AND MIRL, MITL, FIRE AND RESCUE BUILDING, OBSTRUCTION REMOVAL AND MISCELLANEOUS, SITE PREPARATION AND CONSTRUCT LANDING STRIP.
MATAMORAS	NEW		BI		26	CONSTRUCT NEW AIRPORT.
MEADVILLE	•PORT MEADVILLE		GU	YES	42	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, EXTEND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, MITL, MISCELLANEOUS.
MEDIA (PHILADELPHIA)	NEW		GU	YES	36	CONSTRUCT NEW AIRPORT.
MIDDLETOWN (HARRISBURG)	OLMSTED AFB		TR		64	CONSTRUCT APRON AND TAXIWAY.
MILTON	NEW		BI		27	CONSTRUCT NEW AIRPORT.
MONONGAHELA (PITTSBURG)	•JAMES SCOTT THOMPSON MEMORIAL		GU	YES	41	LAND FOR AIRPORT DEVELOPMENT, CONSTRUCT TAXIWAY, EXTEND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, MITL, MISCELLANEOUS.
MONROEVILLE (PITTSBURG)	NEW		GU	YES	40	CONSTRUCT NEW AIRPORT.
MORGANTOWN	NEW		B2		32	CONSTRUCT NEW AIRPORT.
MOUNT PLEASANT	MOUNT PLEASANT SCOTTDALE	P-SU	B2		34	DEVELOPMENT PENDING SITE DECISION.
MOUNT UNION	MOUNT UNION	P-SU	B2		32	DEVELOPMENT PENDING SITE DECISION.
MT POCONO	•MT POCONO		GU		42	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, EXTEND APRON, INSTALL (AND/OR EXTEND) MIRL, MITL, OBSTRUCTION REMOVAL.
MURRYSVILLE (PITTSBURG)	NEW		B2		34	CONSTRUCT NEW AIRPORT.
NEW BETHLEHEM	NEW		B2		35	CONSTRUCT NEW AIRPORT.
NEW CASTLE	•NEW CASTLE MUNICIPAL		GU		40	CONSTRUCT TAXIWAY, MITL, MISCELLANEOUS.
NORRISTOWN	(SEE AMBLER)					
NORTH EAST	NEW		B2		32	CONSTRUCT NEW AIRPORT.
OIL CITY	(SEE FRANKLIN)					
OXFORD (PHILADELPHIA)	OXFORD	P-SU	B2		32	DEVELOPMENT PENDING SITE DECISION.
PATTON	NEW		B2		37	CONSTRUCT NEW AIRPORT.
PHILADELPHIA (PHILADELPHIA)	WINGS FIELD	P-SU	LG	YES	46	DEVELOPMENT PENDING SITE DECISION.
PHILADELPHIA (PHILADELPHIA)	•PHILADELPHIA INTERNATIONAL		TR		105	CONSTRUCT TAXIWAY AND RUNWAY, EXTEND APRON, TAXIWAY AND RUNWAY, INSTALL (AND/OR EXTEND) HIRL AND MIRL, IN-RUNWAY LIGHTS, MITL.
PHILADELPHIA (PHILADELPHIA)	NEW		HE		DC	CONSTRUCT NEW HELIPORT.

Source: National Airport Plan, FY 1968-1972, U.S. Department of Transportation, FAA, 1

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COMMUNITY AND METROPOLITAN AREA	AIRPORT NAME * If Federal Agreement	AIRPORT DATA				RECOMMENDED DEVELOPMENT
		SITE STATUS	KIND OF AIRPORT	CONGESTION RELIEVER	RECOMMENDED RWY LENGTH (100s of Ft.)	
PHILADELPHIA (PHILADELPHIA)	•NORTH PHILADELPHIA		LG	YES	55	CONSTRUCT TAXIWAY, EXTEND RUNWAY, INSTALL (AND/OR EXTEND) HIRL AND MITL, OBSTRUCTION REMOVAL.
PHILADELPHIA (PHILADELPHIA)	NEW		HE		00	CONSTRUCT NEW HELIPORT.
PHILADELPHIA (PHILADELPHIA)	NEW		HE		00	CONSTRUCT NEW HELIPORT.
PHILLIPSBURG	•MID-STATE		LG		60	WIDEN RUNWAY, EXTEND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, OBSTRUCTION REMOVAL.
PITTSBURGH (PITTSBURG)	•ALLEGHENY COUNTY		LG	YES	70	CONSTRUCT TAXIWAY, STRENGTHEN RUNWAY, MITL, MISCELLANEOUS.
PITTSBURGH (PITTSBURG)	•GREATER PITTSBURGH		TR		118	LAND FOR AIRPORT DEVELOPMENT, CLEAR ZONES AND ALS, EXTEND TAXIWAY, STRENGTHEN APRON AND TAXIWAY, INSTALL (AND/OR EXTEND) HIRL AND MIRL, MITL, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
POTTSTOWN (PHILADELPHIA)	•POTTSTOWN MUNICIPAL		GU		35	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, EXTEND RUNWAY AND TAXIWAY, INSTALL (AND/OR EXTEND) MITL AND MIRL.
POTTSVILLE	•JOE ZERBY SCHUYLKILL COUNTY		LG		46	NO DEVELOPMENT RECOMMENDED.
PROSPECTVILLE (PHILADELPHIA)	TURNER AIRFIELD	P-SU	B1	YES	27	DEVELOPMENT PENDING SITE DECISION.
PUNXSUTAWNEY	PUNXSUTAWNEY MUNICIPAL		B2		35	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, EXTEND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, MITL, MISCELLANEOUS.
QUAKERTOWN (PHILADELPHIA)	•UPPER BUCKS COUNTY		B2		32	CONSTRUCT TAXIWAY, EXTEND APRON, INSTALL (AND/OR EXTEND) MIRL.
READING (READING)	*GENERAL CARL A SPAATZ		TR		59	LAND FOR CLEAR ZONES, EXTEND RUNWAY AND TAXIWAY, STRENGTHEN RUNWAY, INSTALL (AND/OR EXTEND) HIRL AND MITL, FIRE AND RESCUE BUILDING, OBSTRUCTION REMOVAL, RELOCATE NAVAIDS, MISCELLANEOUS.
SAYRE	BLUE SWAN	SU	B1		27	DEVELOPMENT PENDING SITE DECISION.
SCRANTON (SCRANTON)	SCRANTON MUNICIPAL		B1		29	LAND FOR CLEAR ZONES, EXTEND RUNWAY, STRENGTHEN RUNWAY, INSTALL (AND/OR EXTEND) MIRL, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
SCRANTON	(SEE WILKES-BARRE)					
SELINSGROVE	•PENN VALLEY		GU		37	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, EXTEND APRON, INSTALL (AND/OR EXTEND) MITL, MISCELLANEOUS.
SHAMOKIN	SHAMOKIN	SU	B2		33	DEVELOPMENT PENDING SITE DECISION.
SHARON	SHARON	R	B2		34	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT APRON, TAXIWAY AND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
SOMERSET (JOHNSTOWN)	•SOMERSET COUNTY		B2		40	LAND FOR CLEAR ZONES, EXTEND RUNWAY, STRENGTHEN RUNWAY, INSTALL (AND/OR EXTEND) MIRL, MITL, MISCELLANEOUS.
ST MARYS	•ST MARYS MUNICIPAL		B2		37	CONSTRUCT TAXIWAY, EXTEND APRON AND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, MITL, MISCELLANEOUS.
STATE COLLEGE	*UNIVERSITY PARK		GU		39	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, WIDEN RUNWAY, EXTEND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
SUNBURY	(SEE SELINGSGROVE)					
SUSQUEHANNA	(SEE HALLSTEAD)					
TARENTUM (PITTSBURG)	REMICH	P-SU	B2	YES	33	DEVELOPMENT PENDING SITE DECISION.
TITUSVILLE	TITUSVILLE		GU		42	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, EXTEND APRON AND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, MISCELLANEOUS.
TOWANDA	•TOWANDA		B1		27	NO DEVELOPMENT RECOMMENDED.
TUNKHANNOCK	SKYHAVEN	P-SU	B1		27	DEVELOPMENT PENDING SITE DECISION.
UNIONTOWN	(SEE CONNELLSVILLE)					
WARREN	WARREN MUNICIPAL	SU	B2		34	DEVELOPMENT PENDING SITE DECISION.
WASHINGTON (PITTSBURG)	•WASHINGTON COUNTY		LG	YES	46	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, WIDEN TAXIWAY AND RUNWAY, EXTEND RUNWAY AND TAXIWAY, INSTALL (AND/OR EXTEND) MIRL, MITL, OBSTRUCTION REMOVAL AND MISCELLANEOUS.

rce: National Airport Plan, FY 1968-1972, U.S. Department of Transportation, FAA, 1967

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PENNSYLVANIA						
COMMUNITY AND METROPOLITAN AREA	AIRPORT NAME * If Federal Agreement	AIRPORT DATA				RECOMMENDED DEVELOPMENT
		SITE STATUS	KIND OF AIRPORT	CONGESTION RELIEVER	RECOMMENDED RWY LENGTH (100s of Ft.)	
WAYNESBURG	*GREEN COUNTY		GU		40	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT TAXIWAY, EXTEND APRON AND RUNWAY, INSTALL (AND/OR EXTEND) MIRL, MITL, OBSTRUCTION REMOVAL AND MISCELLANEOUS.
WELLSBORO	GRAND CANYON STATE	SU	B1		31	DEVELOPMENT PENDING SITE DECISION.
WEST CHESTER (PHILADELPHIA)	WEST CHESTER	P-SU	B2		32	DEVELOPMENT PENDING SITE DECISION.
WILKES-BARRE (WILKES-BARRE-HAZELTON)	WILKES-BARRE WYOMING VALLEY		B2		32	LAND FOR CLEAR ZONES, CONSTRUCT APRON AND TAXIWAY, STRENGTHEN RUNWAY, INSTALL (AND/OR EXTEND) MIRL, OBSTRUCTION REMOVAL.
WILKES-BARRE-SCRANTON (WILKES-BARRE-HAZELTON)	*WILKES-BARRE-SCRANTON		TR		72	LAND FOR AIRPORT DEVELOPMENT AND CLEAR ZONES, CONSTRUCT APRON, WIDEN TAXIWAY, EXTEND RUNWAY AND TAXIWAY, STRENGTHEN RUNWAY, INSTALL (AND/OR EXTEND) HIRL AND MIRL, OBSTRUCTION REMOVAL AND RELOCATE NAVAIDS.
WILLIAMSPORT	*WILLIAMSPORT-LYCOMING CO		TR		66	LAND FOR CLEAR ZONES, EXTEND APRON, TAXIWAY AND RUNWAY, INSTALL (AND/OR EXTEND) HIRL AND MIRL, OBSTRUCTION REMOVAL, RELOCATE NAVAIDS, MISCELLANEOUS.
YORK (YORK)	YORK	SU	LG		46	DEVELOPMENT PENDING SITE DECISION.
YORK	(SEE MIDDLETOWN)					
ZELIENOPLE	NEW		B2		33	CONSTRUCT NEW AIRPORT.
LOCK HAVEN	LOCK HAVEN		B2		34	LAND FOR CLEAR ZONES, INSTALL (AND/OR EXTEND) MIRL, OBSTRUCTION REMOVAL.

Source: National Airport Plan, FY 1968-1972, U.S. Department of Transportation, FAA, 1967

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The listing reflects the communities in the National System of Airports, and the recommended development required at each. To insure proper interpretation of the Plan, the following explanations of column headings and associated airport data are provided:

Column 1. Community and Metropolitan Area

Lists the community, or communities, the airport serves and with which the airport is normally identified. If the airport serves a Standard Metropolitan Statistical Area, the name of the SMSA is shown in parenthesis.

Column 2. Airport Name

Lists the name of the airport. "New" indicates that the airport does not exist, but is needed or planned for the community. An asterisk(*) indicates that the airport is involved in an agreement with the Federal Government (FAAP, DLAND, DCLA, Surplus Property, Federal Airport Act Conveyance).

Column 3. Kind of Airport

Indicates the principal role of the airport in the system during the period FY 1968-72. The kinds of airports and appropriate abbreviations are as follows:

TR - Airports used or to be used by CAB certificated Trunk Carriers or by Local and Trunk Carriers.

LO - Airports used by Local Carriers, Intra-Alaskan and Intra-Hawaiian, but not by any Trunk carriers.

B1 - Basic Utility Airport - Stage 1. (See Section IV for detailed explanation of Utility Airports).

B2 - Basic Utility Airport - Stage 2.

GU - General Utility Airport.

LG - Larger than General Utility Airport.

EX - Smaller than Basic Utility Airport - Stage 1.

HE - Heliport.

SB - Seaplane Base.

Column 4. Congestion Reliever

Indicates, by "yes" if the airport is located in such a manner as to provide relief from air traffic congestion at a high-activity airline-served airport. (See Section IV for a detailed explanation).

Source: National Airport Plan, FY 1968-1972, U.S. Department of Transportation, FAA. [illegible]

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The FAA Airport Plan For Pennsylvania

Column 5. Site Status

Indicates whether the airport is privately owned or whether further study is needed to determine if the existing privately or publicly owned airport is suitable for further development or needs to be replaced by a new publicly owned airport. If this column is left blank, it indicates that the existing airport is publicly owned and is capable of development, or, if a new airport, its ownership is recommended as public. The following abbreviations are used:

P - The airport is owned by other than a public agency, but is open to the public.

SU - Further study of the existing publicly owned airport is needed to determine if it should be developed or if a new airport should be constructed.

P - SU - Further study of the existing privately owned airport is needed to determine if it should be developed of if a new airport should be constructed. (See Section I for detailed explanation).

Column 6. Recommended Length (100)

Indicates the recommended length of the primary runway. The number in this column should be multiplied by 100 to arrive at the length. As heliports and seaplane bases have no runway length, this space is appropriately left blank.

Column 7. Recommended Development

Shows in general terms the development considered necessary during Fiscal Years 1968-1972 at each airport to meet future civil aviation needs. The items shown are limited to those types of development eligible for Federal financial assistance under the FAAP. Not included are items programmed for development under the FAAP prior to the 1967 Program.

Source: National Airport Plan, FY 1968-1972, U.S. Department of Transportation, FAA, 1967

Table B-3

The Appalachian Regional Airport Plan For Pennsylvania

PENNSYLVANIA	Projected Classifications 1966	1967	1969	1971	1976	1981	Projected Improvements, 1967-1971 Commentary	Cost Code
Air Carrier Airports								
Greater Pittsburgh (Pittsburgh)	L	L	L	L	L	L	Acquire land as necessary; extend primary runway from 10,500' to 11,800'; extend secondary runway (5-23) from 5,800' to 8,000'; extend taxiway 10L-28R; provide lighting as appropriate; misc.	Sp. $4.0-5.0 million
Fort Erie (Erie)	S	S	S	S	M	M	Acquire land; extend primary runway from 5,000' to 7,000'; extend taxiways; provide appropriate lighting; misc.	VI
Scranton-Wilkes-Barre (Scranton-Wilkes-Barre)	S	S	S	S	S	M		II
Blair County (Altoona)	F	F	F	F	F	F	Extend taxiway and misc.	II
Bradford-McKean (Bradford)	F	F	F	S	S	S	Acquire land as required; widen and strengthen primary runway; extend runway from 5,000' to 7,700'; provide parallel taxiway; provide appropriate lighting; misc.	$2.0-2.5 million
Chess-Lamberton (Oil City-Franklin)	F	F	F	F	F	F	Acquire land; extend primary runway from 5,200' to 5,500'; widen runway; construct partial parallel taxiway; provide appropriate lighting; misc.	IV
DuBois-Jefferson (DuBois)	F	F	F	F	F	F	Acquire land as necessary; extend primary runway from 4,700' to 6,000'; extend taxiway; provide appropriate lighting; misc.	II
Hazleton Municipal (Hazleton)	F	F	F	F	F	F	Acquire land as necessary; extend runway from 4,913' to 5,800'; extend apron; provide appropriate lighting; misc.	IV

Source: Guidelines For An Appalachian Airport System, Phase II, Appalachian Regional Commission, 1967

Table B-3

The Appalachian Regional Airport Plan For Pennsylvania

PENNSYLVANIA (CONT.)	Projected Classifications						Projected Improvements, 1967-1971	
	1966	1967	1969	1971	1976	1981	Commentary	Cost Code
Air Carrier Airports (cont.)								
Johnstown-Cambria County (Johnstown)	F	F	F	F	F	F	Pave taxiways; provide terminal apron; provide appropriate lighting; misc.	II
Mid-State (Philipsburg-Clearfield)	F	F	F	F	S	S	Extend 1 of 2 runways, as indicated by engineering study, to 5,700'; provide appropriate lighting; misc.	II
Williamsport-Lycoming County (Williamsport)	F	F	F	S	S	S	Acquire land as required; widen and strengthen primary runway; extend runway from 5,040' to 6,700'; improve taxiways and ramp; provide appropriate lighting; misc.	IV
Subtotal, air carrier airports				11				$10,750,000
General Aviation Airports								
Allegheny County (Pittsburgh)	A	A	A	A	A	A	Strengthen runway; extend taxiway; provide appropriate lighting; misc.	III
Beaver County (Beaver Falls)	B	B	B	B	B	B	Not recommended for assistance due to proximity to Greater Pittsburgh Airport.	None
New Castle Municipal (New Castle)	B	B	B	B	B	B	Standard	I
Schuylkill County (Pottsville)	B	B	B	B	B	B	Standard	I

Source: Guidelines For An Appalachian Airport System, Phase II, Appalachian Regional Commission, 1967

Table B-3

The Appalachian Regional Airport Plan For Pennsylvania

PENNSYLVANIA (CONT.)	Projected Classifications 1966	1967	1969	1971	1976	1981	Projected Improvements, 1967-1971 Commentary	Cost Code
General Aviation Airports (cont.)								
Westmoreland-Latrobe (Latrobe)	B	A	A	A	A	A	Acquire land; extend runway from 4,500' to 5,400'; provide parallel taxiway; provide appropriate lighting; misc.	VIII
Butler-Graham (Butler)	C	A	A	A	A	A	Acquire land; extend runway from 4,000' to 5,000'; provide partial taxiway; provide appropriate lighting; misc.	III
Connellsville (Connellsville)	C	C	C	C	C	C	Standard	I
Greene County (Waynesburg)	C	C	C	C	C	C	Standard	I
Indiana County-Jimmy Stewart (Indiana)	C	B	B	B	B	B	Extend runway from 3,600' to 4,100'; acquire land as necessary; provide appropriate lighting and turn-arounds; misc.	I
Lock Haven Municipal (Lock Haven)	C	B	B	B	B	B	Acquire land; extend runway from 3,350' to 3,850'; provide appropriate lighting; misc.	II
Matamoras Municipal (Matamoras)	C	C	C	C	C	C	Standard	I
Mt. Pocono (Mt. Pocono)	C	B	B	B	B	B	Extend runway from 4,000' to 4,400'; provide appropriate lighting; misc.	I
Somerset County (Somerset)	C	C	C	C	B	B	Strengthen primary runway; acquire land for future developments; provide appropriate lighting; misc.	I

Source: Guidelines For An Appalachian Airport System, Phase II, Appalachian Regional Commission, 1967

Table B-3

The Appalachian Regional Airport Plan For Pennsylvania

PENNSYLVANIA (CONT.)	Projected Classifications						Projected Improvements, 1967-1971	
	1966	1967	1969	1971	1976	1981	Commentary	Cost Code
General Aviation Airports (cont.)								
Washington County (Washington)	C	B	B	B	B	B	Extend runway from 3,750' to 4,200'; provide appropriate lighting; acquire land as necessary; misc..	II
Wyoming Valley (Wilkes-Barre)	C	C	C	C	C	C	Not recommended for assistance due to proximity of Scranton/Wilkes-Barre Airport.	None
Ebensburg (Ebensburg)	D	D	B	B	B	B	Acquire land if necessary; extend runway from 3,200' to 4,450'; provide appropriate lighting; misc.	II
Grand Canyon State (Wellsboro)	D	D	D	D	D	D	None	None
Lawrence (Corry)	D	D	D	C	B	B	Acquire land if necessary; extend primary runway from 3,000' to 3,600'; misc.	II
Mifflin County (Reedsville)	D	D	D	D	D	A	Recently built.	I
Penn Valley (Selinsgrove)	D	D	B	B	B	B	Acquire land if necessary; extend runway from 3,000' to 3,800'; provide appropriate lighting; misc.	II
Port Meadville (Port Meadville)	D	C	C	C	C	C	Acquire land if necessary; extend runway from 3,000' to 3,500'; misc.	I
Punxsutawney Municipal (Punxsutawney)	D	D	D	D	D	D	Standard	I
St. Marys Municipal (St. Marys)	D	D	D	D	C	A	Standard	I

Source: Guidelines For An Appalachian Airport System, Phase II, Appalachian Regional Commission, 1967

Table B-3

The Appalachian Regional Airport Plan For Pennsylvania

PENNSYLVANIA (CONT.)	Projected Classifications						Projected Improvements, 1967-1971	
	1966	1967	1969	1971	1976	1981	Commentary	Cost Code
General Aviation Airports (cont.)								
J. S. Thompson Memorial (Monongahela)	D	D	D	D	D	D	Not recommended for assistance due to proximity to Allegheny County Airport.	None
University Park (State College)	D	B	B	B	B	B	Acquire land if necessary; extend runway from 3,000' to 4,100'; provide lighting as appropriate; misc.	II
Scranton Municipal (Scranton)	M-P	M-P	M-P	M-P	M-P	M-P	Not recommended for assistance due to proximity to Wilkes-Barre/Scranton Airport.	None
Towanda (Towanda)	M-P	M-P	M-P	M-P	M-P	M-P		None
Warren Municipal (Warren)	M-P	C	C	C	C	C	Acquire land as necessary; pave second runway to make primary runway (present primary runway has obstacle problem); provide appropriate lighting; misc.	II
Bloomsburg Municipal (Bloomsburg)	M-U	C	C	C	C	B	Acquire land; extend runway from 2,800' to 3,200' and pave; provide lighting and aprons as appropriate; misc.	II
Blue Swan (Sayre)	M-U	M-U	M-U	M-U	M-U	M-U	None	None
Clearfield (Clearfield)	M-U	C	C	C	C	C	Acquire site and construct new airport with paved runway to 3,900'; provide aprons, taxiways, and lighting as appropriate; misc.	II
Danville (Danville)	M-U	M-U	M-U	M-U	M-U	M-U	Not recommended for assistance due to proximity to Bloomsburg Airport.	None
Eagles Mere Municipal (Eagles Mere)	M-U	M-U	M-U	M-U	M-U	M-U	None	None

Source: Guidelines For An Appalachian Airport System, Phase II, Appalachian Regional Commission, 1967

Table B-3

The Appalachian Regional Airport Plan For Pennsylvania

PENNSYLVANIA (CONT.)	Projected Classifications						Projected Improvements, 1967-1971	
	1966	1967	1969	1971	1976	1981	Commentary	Cost Code
General Aviation Airports (cont.)								
Emlenton (Emlenton)	M-U	M-U	M-U	M-U	M-U	M-U	None	None
Greenville Municipal (Greenville)	M-U	D	D	D	D	D	Acquire land; pave to 2,800'; misc.	I
Keystone Park (Emporium)	M-U	C	C	C	C	C	Acquire site and construct new airport with paved runway to 3,300'	II
Potato City (Coudersport)	M-U	D	D	D	D	D	Pave to 3,300'; provide appropriate lighting; misc.	I
Splane Memorial (Oil City)	M-U	M-U	M-U	M-U	M-U	M-U	Not recommended for assistance due to proximity to Franklin/Oil City Airport.	None
New General Aviation Airports								
Armstrong County	--	D	D	D	D	D		III
Bedford County	--	C	C	C	C	C		III
Clarion County	--	D	D	D	D	D		III
Huntingdon County	--	C	C	C	C	C		III
Susquehanna County	--	D	D	D	D	D		III
Wayne County	--	C	C	C	C	C		III

Source: Guidelines For An Appalachian Airport System, Phase II, Appalachian Regional Commission, 1967

Table B-3

The Appalachian Regional Airport Plan For Pennsylvania

PENNSYLVANIA (CONT.)	Projected Classifications 1966	1967	1969	1971	1976	1981	Projected Improvements, 1967-1971 Commentary	Cost Code
New General Aviation Airports (cont.)								
Provision has been made for 3 airports, the location to be determined by local need and interest during the period 1967-1971.	--	--	--	C	C	C		III
	--	--	D	D	D	D		III
	--	--	--	D	D	D		III
Perry County	--	--	--	--	--	D		
Subtotal, general aviation airports				47				$9,075,000
Total, air carrier and general aviation airports				58				$19,825,000

Source: Guidelines For An Appalachian Airport System, Phase II, Appalachian Regional Commission, 1967

Table B-3

The Appalachian Regional Airport Plan For Pennsylvania

Explanatory Notes:

1. Airport Classification designations are:

   Air Carrier Airports
   L = Large gateway.
   M = Medium gateway.
   S = Small gateway.
   F = Local service airport.

   General Aviation Airports
   A = Substantially all general aviation aircraft types, including turbine and transport aircraft.
   B = Single-engine and multi-engine piston aircraft types (except transports) and some turbine types.
   C = Most twin-engine aircraft types (except transports).
   D = Most single-engine aircraft types.

2. The term "standard" refers to an allowance for minor but necessary projects expected over a five-year period. See further discussion in Chapter VII, "Priorities," under "General Aviation" section.

3. Cost Code designations are:

I	Below $100,000
II	$100,000-249,000
III	$250,000-499,000
IV	$500,000-749,000
V	$750,000-999,000
VI	$1,000,000-1,499,000
VII	$1,500,000-1,999,000
VIII	$2,000,000 and over

Source: Guidelines For An Appalachian Airport System, Phase II, Appalachian Regional Commission, 1967

Programs of the U.S. Department of Transportation

PROGRAM TITLE	AIRPORT DEVELOPMENT PROGRAM
NATURE AND PURPOSE OF PROGRAM	This program provides financial aid and other assistance to public agencies in the planning, acquisition, and development of public airports and heliports to help them take part in developing an adequate nationwide system of public airports. It also provides for the conveyance of Federal lands under certain circumstances, where needed, to carry out an airport project or for the operation of a public airport, and provision and operation of air navigation facilities. Property interests in Federal lands, where appropriate, as well as Federal grants, are available for projects that are essential to the operation and safety of airports. Grants can be made for: (1) land acquisition, (2) site preparation, (3) construction, alteration, and repair of runways, taxiways, aprons, and roads within airport boundaries, and (4) construction and installation of lighting and utilities and certain other on-site and off-site work. The Federal government generally provides 50 percent of the cost and the local public authority provides the remaining 50 percent
WHO CAN APPLY	State, county, municipal, and other public agencies are eligible if their airport requirements are shown in the National Airport Plan. (See Table B-2)
FOR INFORMATION CONTACT	Federal Aviation Administration U. S. Department of Transportation Washington, D. C. 20553 or: FAA regional offices
PRINTED INFORMATION AVAILABLE	Federal Aid Airport Program, Publishing and Graphics Branch, FAA Part 151, Federal Aviation Regulations 14 CFR Chap. 1, Publishing and Graphics Branch, FAA Part 153, Federal Aviation Regulations 14 CFR Chap. 1, Publishing and Graphics Branch, FAA
AUTHORIZING LEGISLATION	Federal Airport Act, 1964 as amended; P.L. 88-280; 78 STAT 158; 49 USC 1101-1120; 50 USC 16220.

PROGRAM TITLE

COAST GUARD MARINE, HARBOR, AND WATERFRONT SERVICES

NATURE AND PURPOSE OF PROGRAM

The Coast Guard makes available a wide range of marine, harbor, and waterfront services to local government officials, law enforcement agencies, the Merchant Marine, and to private citizens.

The Coast Guard: (1) provides aids-to-navigation on navigable waters and waterfront facilities, (2) inspects merchant vessels and enforces safety requirements for seaworthiness, (3) inspects small craft to insure compliance with safety standards and rules of the road, (4) provides aircraft and marine craft for rescue operations during natural and man-caused disasters, (5) provides icebreaking facilities to open ice-bound waterways, (6) enforces the Oil Pollution Act to protect humans, fish, and wildlife from water pollution and contamination, (7) patrols marine regattas and boat races in cooperation with local officials, (8) provides literature and films for public information, and (9) protects and enforces security of harbors and waterfronts by operating fire prevention facilities, supervising loading of dangerous cargo, controlling movement and anchorage of ships, controlling access to vessels and port areas, and issuing port security cards.

WHO CAN APPLY

Federal, state, and local government and law enforcement officials are eligible for Coast Guard services; also eligible are organizations and individuals interested in boating, shipping, water safety, and marine services.

FOR INFORMATION CONTACT

Commandant, U. S. Coast Guard
U. S. Department of Transportation
Washington, D. C. 20226

or: Local commander,
Coast Guard district

PRINTED INFORMATION AVAILABLE

Aids to Navigation of the United States, CG-193
Security of Vessels and Waterfront Facilities, CG-239
Conditions for Designation of a Designated Waterfront Facility, CG-252
Rules of the Road, CG-169; *Pleasure Craft*, CG-290
Catalog of Coast Guard Films, CG-386
Proceedings of the Merchant Marine Council, CG-129

AUTHORIZING LEGISLATION

5 USC 552; 14 USC a, 81-90; 14 USC 2.

PROGRAM TITLE	DEVELOPMENT HIGHWAYS AND ACCESS ROADS FOR THE APPALACHIAN REGION
NATURE AND PURPOSE OF PROGRAM	This program provides financial assistance for construction of: (1) a development system highway (not to exceed 2,350 miles) in the Appalachian region where commerce and communication have been inhibited by inadequate access, and (2) local access roads (not to exceed 1,000 miles) which will serve specific recreational, residential, commercial, industrial interests, or will facilitate a school consolidation program. Federal assistance may not exceed 50 percent of project costs unless the Secretary of Transportation guided by recommendation of the Appalachian Regional Commission, determines that more (not to exceed 70 percent) is required. Approved projects will be built by the state highway departments under the supervision of the Bureau of Public Roads. The states must assume maintenance responsibility for all completed projects and may be required to use coal derivatives in the construction of not more than 10 percent of the roads.
WHO CAN APPLY	State and local agencies wishing to recommend projects should do so through their state member (the Governor or his designated representative) of the Appalachian Regional Commission. The Commission makes recommendations to the Secretary of Transportation on: the general corridor location and termini of the development system highways; designation of local access roads; priorities for construction; and other pertinent criteria. Each state member of the Commission must obtain the recommendations of his state highway department before voting on any project. The Secretary of Transportation has the authority to approve the Commission recommendations, in whole or in part.
FOR INFORMATION CONTACT	Appalachian Regional Commission Washington, D. C. 20235 or: Economic Development Assistanc U. S. Department of Commerce Washington, D. C. or: Bureau of Public Roads Department of Transportation Washington, D. C.
PRINTED INFORMATION AVAILABLE	None
AUTHORIZING LEGISLATION	Appalachian Regional Development Act of 1965; P.L. 89-4; 79 STAT 5 as amended by P.L. 89-670, Sec. 8(b).

PROGRAM TITLE	HIGH-SPEED GROUND TRANSPORTATION
NATURE AND PURPOSE OF PROGRAM	This program sponsors research and demonstration projects in high-speed ground transportation to promote a safe, adequate, economical, and efficient national transportation system. Research programs include components, aerodynamics, propulsion, control, communications, and guideways. Demonstration projects should contribute to development of better intercity transportation, and should measure and evaluate public response to new equipment, higher speed, variations in fares, comfort and convenience, and more frequent service. The program also provides for the collection and collation of transportation information, data, and statistics that contribute to improvement of the national transportation system. Provision is made to protect the interests of employees of any common carrier affected by demonstration projects involving a contract with such carrier.
WHO CAN APPLY	Contracts may be awarded to public or private agencies, institutions, organizations, corporations, or individuals. In contracts for demonstration projects, financial participation by private industry should be to the maximum extent possible.
FOR INFORMATION CONTACT	U. S. Department of Transportation Washington, D. C. 20553
PRINTED INFORMATION AVAILABLE	None
AUTHORIZING LEGISLATION	High-Speed Ground Transportation Study Act; P.L. 89-220; 79 STAT 893.

PROGRAM TITLE	HIGHWAY BEAUTIFICATION
NATURE AND PURPOSE OF PROGRAM	This program provides financial assistance to state highway departments for the purpose of beautifying highways and communitie by: controlling outdoor advertising signs, billboards, and displa controlling the establishment, use, and maintenance of junkyards i areas adjacent to highways; landscaping and otherwise enhancing th scenery along Federal-aid highways, and by other means. The Federal share of costs incurred by control of outdoor advertising and junkyards is generally 75 percent. An amount equival to 3 percent of funds apportioned to a state highway department for Federal-aid highways is allocated to that department for landscapi and roadside development, including acquisition and development of publicly-owned and controlled rest and recreation areas and sanitar and other facilities necessary to accommodate the traveling public. Matching state funds are not required.
WHO CAN APPLY	Any State Highway Department or State DOT may enter into an agreement with the U.S. Secretary of Transportation.
FOR INFORMATION CONTACT	Bureau of Public Roads U. S. Department of Transportation Washington, D. C. 20553 or: Regional or state offices of the Bureau of Public Roads or: State highway departments
PRINTED INFORMATION AVAILABLE	Public Participation in Highway Beautification Highways to Beauty, 1966 (20¢) Available from: Superintendent of Documents U. S. Government Printing Office Washington, D. C. 20402
AUTHORIZING LEGISLATION	Highway Beautification Act of 1965; P.L. 89-285; 79 STAT 1028; Sections 131, 136 and 319, Title 23, USC as amended by the Federal-aid Highway Act of 1966, P.L. 89-574; 80 STAT 766.

PROGRAM TITLE

HIGHWAY PLANNING AND CONSTRUCTION

NATURE AND PURPOSE OF PROGRAM

This program provides financial assistance to state highway departments for constructing the Interstate Highway System and for building or improving primary and secondary roads and streets. Funds authorized by Congress are apportioned to the states and must be matched on a 90 percent Federal, 10 percent state basis for the Interstate System and 50-50 for other projects. (States contribute less if they have large areas of public lands.) The funds may be used for planning, engineering, right-of-way, acquisition, new construction, improvement, roadside beautification, recreation, and rest areas. System routes and annual programs of projects are selected by the state highway departments, in cooperation with local officials where pertinent, and subject to approval by the Bureau of Public Roads. Roads and streets improved with Federal aid remain under ownership of state or local governments.

WHO CAN APPLY

Federal-aid highway funds are available only to the state highway departments or DOT's. Some county and local roads and streets are on the Federal-aid systems and are eligible for improvement, but only through state high departmen or DOT's initiative and action.

Financial assistance is available to state highway departments or DOT's for reconstruction of roads and bridges on Federal-aid highway systems that are so damaged by floods, earthquakes, etc., as to deplete the state's resources.

FOR INFORMATION CONTACT

Bureau of Public Roads
U. S. Department of Transportation
Washington, D. C. 20553

or: Regional or state offices of the Bureau of Public Roads
or: State highway departments

PRINTED INFORMATION AVAILABLE

America's Lifelines - Federal Aid for Highways, 1966 (20¢)
Freeways to Urban Development (15¢)
Available from: Superintendent of Documents
U. S. Government Printing Office
Washington, D. C. 20402

AUTHORIZING LEGISLATION

Title 23, USC, "Highways" as amended by Federal-aid Highway Act of 1966; P.L. 89-574; 80 STAT 766.

PROGRAM TITLE	HIGHWAY STUDIES
NATURE AND PURPOSE OF PROGRAM	The Federal-aid highway program includes funds specifically for planning and research. Such research includes studies of maximizing the contribution of highways to national, state, and local urban and rural needs; the role of highway planning in comprehensi community and regional planning; and the actual and forecasted interaction between highways and concentrations of residences, jobs and other land uses.
WHO CAN APPLY	Local governments are eligible for highway studies through state highway organizations.
FOR INFORMATION CONTACT	Federal Highway Administrator U. S. Department of Transportation Washington, D. C. 20552 or: Regional or state offices, Bureau of Public Roads or: State highway department
PRINTED INFORMATION AVAILABLE	Highway Program Planning Manual
AUTHORIZING LEGISLATION	23 USC 307.

PROGRAM TITLE	NATIONAL HIGHWAY SAFETY PROGRAM
NATURE AND PURPOSE OF PROGRAM	The National Highway Safety Agency administers a wide range of highway safety programs including a state matching grant-in-aid program and extensive research and development activities. The Agency's highway safety research and development program provides funds to investigate such areas as driver education and licensing, vehicle inspection, traffic control procedures and other related programs. In addition, the Secretary for Transportation may use these research and development funds for: (1) grants to state or local agencies, institutions, and individuals for training or educating highway safety personnel, (2) research fellowships in highway safety, (3) development of improved accident investigation procedures, (4) emergency service plans, and (5) demonstration projects.
WHO CAN APPLY	The Agency will provide matching funds to those state safety programs approved by the Secretary of Transportation and in accordance with uniform standards promulgated by the Secretary. Political subdivisions may participate in state safety programs and receive matching funds if their programs are coordinated and administered through the governor of the state.
FOR INFORMATION CONTACT	National Highway Safety Bureau Federal Highway Administration Department of Transportation Washington, D. C. 20553
PRINTED INFORMATION AVAILABLE	None
AUTHORIZING LEGISLATION	National Highway Safety Program: P.L. 89-564; 89th Congress, Section 3052; September 9, 1966; 80 STAT 731.

PROGRAM TITLE	AIDS TO SHIPPING AND SHIPBUILDING
NATURE AND PURPOSE OF PROGRAM	The Maritime Administration of the Department of Commerce is responsible for promoting the development and maintenance of the United States Merchant Marine. The Maritime Administration gives direct financial aid to shipping and shipbuilding as follows: (1) it provides operating-differential subsidies to ship operators who sail merchant ships on essential foreign trade routes, (2) it provides construction-differential subsidies to U. S. citizen applicants for the construction, reconstruction or reconditioning of merchant ships used in U. S. foreign commerce, and (3) it insures loans and mortgages provided by private lending institutions for the construction, reconstruction, or reconditioning of merchant ships in U. S. shipyards.
WHO CAN APPLY	Any United States citizen may apply for these government aids. Aid is contingent upon applicant's compliance with stipulations of the Merchant Marine Act, 1936, as amended, and the implementing regulations of the Maritime Administration.
FOR INFORMATION CONTACT	Department of Commerce Maritime Administration Washington, D. C. 20235
PRINTED INFORMATION AVAILABLE	The United States Merchant Marine - A Brief History Federal Ship Mortgage Insurance
AUTHORIZING LEGISLATION	Merchant Marine Act, 1936 as amended.

PROGRAM TITLE

DEVELOPMENT OF PORTS

NATURE AND PURPOSE OF PROGRAM

Through the port development program, the Maritime Administration promotes projects to reduce port costs and increase ship productivity by improving methods of handling and stowing cargo, developing container-unit systems, reducing ship turnaround time, and using ports, port facilities, labor resources, and management techniques more efficiently and economically.

Besides promoting improvements of port and terminal operations and maritime transportation systems, the Maritime Administration (1) advises communities on port development, including the appropriate location and construction of wharves, piers, and water terminals, and on port administration and operation, (2) investigates the practicability and advantages of harbor, river, and port improvements, (3) determines the causes and possible remedies of port congestion, and (4) studies territorial zones tributary to ports, taking into consideration the economics of rail, water, and highway transportation and the flow pattern of commerce.

WHO CAN APPLY

State and local governments, including port authorities are eligible.

FOR INFORMATION CONTACT

U. S. Department of Commerce
Maritime Administration
Office of Maritime Promotion
Washington, D. C. 20235

PRINTED INFORMATION AVAILABLE

Economic Impact of U. S. Ocean Ports

AUTHORIZING LEGISLATION

Section 8, Merchant Marine Act, 1920 as amended, 41 STAT 992.

PROGRAM TITLE	GEODETIC CONTROL SURVEYS AND TIDELAND STUDIES
NATURE AND PURPOSE OF PROGRAM	This program assists in establishing geodetic control as the basis for highway construction, bridge construction, water supply surveys, surveys for urban development and renewal, mapping, aerial photography, and determination of block dimensions. It assists in studies of tidelands to provide a basis for settling boundary disputes. Projects are generally undertaken on a cost-sharing basis.
WHO CAN APPLY	States, counties, and municipalities are eligible to apply for assistance.
FOR INFORMATION CONTACT	Environmental Science Services Administration (ESSA) Coast and Geodetic Survey U. S. Department of Commerce Washington Science Center Rockville, Maryland 20852
PRINTED INFORMATION AVAILABLE	The Coast and Geodetic Survey, Its Products and Services (30¢) Available from: Superintendent of Documents U. S. Government Printing Office Washington, D. C. 20402
AUTHORIZING LEGISLATION	P.L. 80-373; 61 STAT 787; 33 USC 883A.

PROGRAM TITLE	GRANTS AND LOANS FOR PUBLIC WORKS AND DEVELOPMENT FACILITIES
NATURE AND PURPOSE OF PROGRAM	This program provides grants of up to 50 percent of the development cost for such public facilities as water and sewer systems, access roads to industrial parks or areas, harbor facilities, railroad sidings and spurs, public tourism facilities, vocational schools, flood control projects, and site improvements for industrial parks. Severely depressed areas that cannot match Federal funds may receive supplementary grants to bring the Federal contribution up to 80 percent of the project cost. Loans are also available for public works and development facility projects. These loans may pay the full cost of a project and may run for as long as 40 years, the interest being determined by government borrowing costs. A community that is unable to raise its share of the eligible project cost may receive a grant for 50 percent or more of the project's cost and a Federal loan for the remainder of the cost.
WHO CAN APPLY	Jurisdictions designated as redevelopment areas may qualify for grants and loans. These areas may be counties, labor areas, or larger cities characterized by high unemployment or low family income.
FOR INFORMATION CONTACT	Economic Development Administration U. S. Department of Commerce Washington, D. C. 20230
PRINTED INFORMATION AVAILABLE	Building Communities with Jobs, EDA Grants and Loans for Public Works and Development Facilities, EDA Areas Eligible for Financial Assistance Guides for Overall Economic Development Programs Economic Development, Directory of Approved Projects
AUTHORIZING LEGISLATION	Public Works and Economic Development Act of 1965; P.L. 89-136; 79 STAT 552.

PROGRAM TITLE	SHIP EXCHANGE PROGRAM
NATURE AND PURPOSE OF PROGRAM	The Maritime Administration is authorized to acquire non-subsidized United States flag ships in exchange for more modern and efficient warbuilt ships owned by the United States. This program is designed to improve the type and suitability of ships operating in the foreign and domestic commerce of the United States. It is the polic of the Maritime Administration to encourage such ship exchanges to upgrade the United States tramp and domestic fleets and to improve our national defense capability. The law authorizing this program expires July 5, 1970.
WHO CAN APPLY	Any operator with financial and operating capability who meets Maritime Administration regulations may acquire ships under this program. The ship turned in by the operator must (1) weigh 1,500 gross tons or more, (2) have been constructed or contracted for by U. S. shipyards before September 3, 1945, (3) be owned by a United States citizen, (4) be documented under the laws of the United States, and (5) not be operated with operating-differential subsidy for at least three years immediately prior to the exchange.
FOR INFORMATION CONTACT	U. S. Department of Commerce Maritime Administration Washington, D. C. 20235
PRINTED INFORMATION AVAILABLE	None
AUTHORIZING LEGISLATION	Section 510 (i), Merchant Marine Act, 1936 as amended, P.L.89-254; 79 STAT 980.

PROGRAM TITLE	SUPPLEMENTAL GRANTS-IN-AID FOR APPALACHIA
NATURE AND PURPOSE OF PROGRAM	Because many Appalachian communities have been unable to raise their share of matching funds for Federally aided projects, the Appalachian Regional Development Act provides for supplementary grants to bring total Federal participation up to 80 percent of the total project cost. These supplements apply to all Federal grant-in-aid programs in existence at the time of the Appalachian Act's enactment. They include airport construction*, vocational education schools, hospitals, flood control projects, libraries, and educational television facilities. The amount of Federal money above the normal Federal share of a project will depend upon the relative need of the community, its ability to raise matching funds, and the area which the project will serve. These determinations will be made by the Appalachian Regional Commission, to which project applications must be submitted, and by the Secretary of Commerce, whose final approval is required for their implementation.
WHO CAN APPLY	Appalachian communities are eligible for supplemental grants. Project applications are submitted to the Appalachian Regional Commission by the State member of the Commission and not by the community directly. All projects will be evaluated on the basis of their contribution to the economic development of the area they serve.
FOR INFORMATION CONTACT	Appalachian Regional Commission Washington, D. C. 20235
PRINTED INFORMATION AVAILABLE	*Guidelines for an Appalachian Airport System, Phase II, Appalachian Regional Commission, 1967. (See Table B-3)
AUTHORIZING LEGISLATION	Appalachian Regional Development Act of 1965; P.L. 89-4; 79 STAT 5.

PROGRAM TITLE	WEATHER AND CLIMATE GUIDANCE
NATURE AND PURPOSE OF PROGRAM	The Environmental Science and Services Administration (ESSA) through its local weather stations disseminates weather summaries, warnings of impending severe weather and routine forecasts up to 48 hours. Weather data is provided for all segments of the economy; meteorological know-how is provided for research in plant-weather relationships, and to help farmers take advantage of the weather; forecasts, warnings and advisories are prepared in forested areas for special needs of fire prevention and suppression and for forestry management operations; forecasts of air pollution are provided to advise officials of potential troublesome accumulations of pollution; and special forecasts and other meteorological information are available to the public. In localities desiring a weather reporting station at an airport, information is available on types and specifications of instruments and equipment available, and instructions are provided for recording aviation weather observations.
WHO CAN APPLY	There are no restrictions on eligibility.
FOR INFORMATION CONTACT	Environmental Science and Services Administration Weather Bureau U. S. Department of Commerce Washington, D. C. 20910
PRINTED INFORMATION AVAILABLE	None
AUTHORIZING LEGISLATION	26 STAT 653; 15 USC 313; 49 USC 1463.

Programs of the U.S. Department of Housing and Urban Development

PROGRAM TITLE	MODEL NEIGHBORHOODS IN DEMONSTRATION CITIES
NATURE AND PURPOSE OF PROGRAM	This program provides grants and technical assistance to plan, develop and carry out comprehensive programs for rebuilding or restoring slum and blighted areas through coordinated use of all available Federal programs and private and local resources. Grants include: (1) 80 percent of the costs of planning and developing local model cities programs; (2) 80 percent of the cost of administering approved programs; and (3) supplements up to 80 percent of the total non-Federal contribution required under existing Federally assisted projects or activities carried out as part of an approved program. Supplemental grants may be used, without further local matching, for any project or activity included as part of the approved program. The funds must be used first to support new projects and activities not otherwise assisted under an existing Federal grant program. To the extent they are not so needed, they can be used to make up the non-Federal contribution to new Federally assisted projects or activities. Neighborhood residents should become involved in program planning and execution. Plans should cover housing, jobs, and education, and such associated problems as health and social services, transportation, crime, and recreation.
WHO CAN APPLY	Grants will be made to a "city demonstration agency" which may be a city, county, single or jointly acting municipalities, or single or jointly acting local public agencies designated by local government to administer the program. Applications must detail the city's problems and proposed action plans for their solution. Areas selected in cities should contain such problems as serious deficiencies in housing, environment, and education and high concentrations of poverty, unemployment, and ill health. Program planning may run from six to twelve months. Upon completion of planning, applications may be made for grants.
FOR INFORMATION CONTACT	Model Cities Administration Department of Housing and Urban Development Washington, D. C. 20410 or: Housing and Urban Development regional offices
PRINTED INFORMATION AVAILABLE	Model Neighborhoods under the Demonstration Cities Act Improving the Quality of Urban Life, HUD PG-47
AUTHORIZING LEGISLATION	Demonstration Cities and Metropolitan Development Act of 1966, Title I; P.L. 89-754; 80 STAT 1255; 42 USC 3301-3313.

ROGRAM TITLE	PUBLIC FACILITY LOANS
ATURE AND URPOSE OF ROGRAM	This program provides long-term construction loans, up to 40 years, to finance the construction of all types of public works, other than school facilities, when such credit is not otherwise available on reasonable terms. Loans may cover up to 100 percent of the project cost.
HO CAN PPLY	Any local unit of government or state instrumentality (city, town, village, township, county, public corporation or board, sanitary or water district, and Indian tribe) that has the legal authority to build public works and issue bonds to pay for them, is eligible; however, the applicant community must have a population of under 50,000. In designated development areas, population may be up to 150,000. Areas near research and development installations of the National Aeronautics and Space Administration are not subject to a population limit. A nonprofit private corporation serving a community under 10,000 population also is eligible for assistance, but for water and sewer facilities only.
OR NFORMATION ONTACT	Office of the Assistant Secretary for Metropolitan Development Department of Housing and Urban Development Washington, D. C. 20410 or: Housing and Urban Development regional offices
RINTED NFORMATION VAILABLE	Public Facility Loans Fact Sheet
JTHORIZING EGISLATION	Housing Amendments of 1955; P.L. 84-345; 69 STAT 642; 42 USC 1491-1947 (1964) as amended.

PROGRAM TITLE	SUPPLEMENTARY GRANTS FOR PLANNED METROPOLITAN DEVELOPMENT
NATURE AND PURPOSE OF PROGRAM	This program is designed to relieve the financial pressures accompanying local metropolitan development problems. The program specifies ten Federally assisted programs eligible for supplementary grants of up to 20 percent of the total cost above the already specified grant, but, which added together, cannot exceed 80 percent. These programs, already funded at between 50 percent and 66-2/3 percent, are now eligible for from 70 to 80 percent funding. They include: basic water and sewer facilities; libraries; hospitals and medical facilities; sewer treatment works; ABC highways; airport development; urban mass transportation facilities and equipment; acquisition and development of open space land, urban beautification and improvement and historic preservation; acquisition and development of lands and waters for recreational purposes; and grants for public works and facilities in redevelopment areas.
WHO CAN APPLY	Eligibility includes state and local public bodies and agencies in those metropolitan areas that maintain and follow current areawide comprehensive planning and programming adequate for evaluating and guiding all actions, both public and private, of metropolitanwide or interjurisdictional significance. The grants would be available only to those public bodies in the eligible metropolitan areas that are carrying out, in accord with the areawide planning and programming, the location and scheduling of their public facilities; their zoning and other subdivision control actions; and their other policies and actions of metropolitanwide or interjurisdictional significance.
FOR INFORMATION CONTACT	Office of Intergovernmental Relations and Urban Program Coordination Department of Housing and Urban Development Washington, D. C. 20410 or: Housing and Urban Development regional office
PRINTED INFORMATION AVAILABLE	None
AUTHORIZING LEGISLATION	Demonstration Cities and Metropolitan Development Act of 1966, Title II; P.L. 89-754; 80 STAT 1255; 42 USCA 3331-3339.

ROGRAM TITLE

URBAN MASS TRANSPORTATION

IATURE AND 'URPOSE OF 'ROGRAM

This program provides grants and loans (not both for the same project) to help develop and improve mass transportation systems in urban areas. Up to two-thirds of the cost may be covered by a grant for acquisition, construction, and improvement of facilities and equipment that cannot be financed from transit system revenues. The community must have a completed mass transportation plan and program as part of the community comprehensive plan.

Repairs, maintenance and other operating costs, and ordinary governmental expenses are not eligible project costs.

If financing is not otherwise available on reasonable terms, a capital loan may be made for the entire cost of the facility or equipment. If planning is under way but not completed, the applicant may receive assistance under the "Emergency Program" for not more than a 50 percent grant, with an additional amount up to two-thirds payable if the planning is completed within three years.

IHO CAN \PPLY

Eligiblity includes states, municipalities, political subdivisions, public agencies and instrumentalities of one or more states or of one or more municipalities or other political subdivisions of states; and public corporations, boards, and commissions established under state law.

FOR INFORMATION CONTACT

Urban Transportation Administration
Office of the Assistant Secretary for
Metropolitan Development
Department of Housing and Urban Development
Washington, D. C. 20410

or: U. S. Department
of Housing and
Urban Development
regional offices

'RINTED INFORMATION \VAILABLE

Capital Grants and Loans for Urban Mass Transportation, Information for Applicants
Urban Mass Transportation, Program Planning Requirements Guide Applicants
Directory and Digest of Mass Transportation Projects, 1966
Urban Public Transportation, Selected References, [illegible] MP-3

\UTHORIZING LEGISLATION

Urban Mass Transportation Act of 1964; P.L. 88-365; 75 STAT 302; 49 USC 1601.

PROGRAM TITLE	URBAN MASS TRANSPORTATION DEMONSTRATION GRANTS
NATURE AND PURPOSE OF PROGRAM	This program provides grants to assist in testing and demonstrating new ideas and methods for improving mass transportation systems and service. Each demonstration project is intended to benefit not only the community involved but other communities with similar problems by making the results and data of the project available to others. Maximum grant for a project has been established at two-thirds of cost; 100 percent of cost may be covered when a strong national interest would be served.
WHO CAN APPLY	State, interstate, regional, or local public bodies may submit proposals by letter describing the objective and activities to be undertaken along with costs.
FOR INFORMATION CONTACT	Urban Transportation Administration U. S. Department of Housing and Urban Development Washington, D. C. 20410
PRINTED INFORMATION AVAILABLE	Urban Mass Transportation, fact sheet
AUTHORIZING LEGISLATION	Urban Mass Transportation Act of 1964 as amended; P.L. 88-365; 78 STAT 302.

PROGRAM TITLE	URBAN RENEWAL PROJECTS
NATURE AND PURPOSE OF PROGRAM	This program provides grants, planning advances, and temporary loans and guarantees to help public agencies eliminate blight in urban areas through surveys and planning, land acquisition and clearing, rehabilitation of existing structures, new building construction, and the installation of public improvements including streets and sidewalks, utilities, incidental recreational areas, flood protection, preservation of historic structures, etc. Technical assistance is available to local public agencies. Special assistance is available for displaced residents and businesses (including loans to small businesses) and priorities for home purchase or rent by displaced people. Public agencies may include local hospital and university expansion programs as part of their local contributions.
WHO CAN APPLY	The local public agency, depending upon state enabling legislation, may be a public corporation, such as a local renewal agency or housing authority, or a local government department. The urban renewal project must be approved by resolution of the local governing body. The locality must adopt, and have certified by the Secretary, a workable program for community improvement.
FOR INFORMATION CONTACT	Renewal Assistance Administration Department of Housing and Urban Development Washington, D. C. 20410 or: Housing and Urban Development regional offices
PRINTED INFORMATION AVAILABLE	Summary of the Urban Renewal Program The Workable Program for Community Improvement Housing and Urban Development Notes
AUTHORIZING LEGISLATION	Housing Act of 1949; P.L. 81-171; 68 STAT 414 as amended; 42 USC 1450-1465 (1964) as amended; 42 USC 1451-1466 (Supp. I, 1965) as amended; 42 USCA 1453-1463.

PROGRAM TITLE	URBAN RENEWAL REHABILITATION AND CODE ENFORCEMENT
NATURE AND PURPOSE OF PROGRAM	This program is designed to assist communities prevent blight and achieve rehabilitation without displacing existing property owners and tenants. It is based on a workable program for rehabilitation in cooperation with the local government and the affected land owners. The local government concentrates on the enforcement of minimum housing, public health standards, the improvement of public rights-of-way and utilities. Private owners are responsible for upgrading their properties. Grants are available to local governments for concentrated code enforcement; direct property rehabilitation loans are available as well as property improvement grants for low-income homeowners.
WHO CAN APPLY	Eligibility includes local governments who adopt and have certified a "Workable Program for Community Improvement" and individual property owners within the community and designated areas who upgrade their properties.
FOR INFORMATION CONTACT	Renewal Assistance Administration Department of Housing and Urban Development Washington, D. C. 20410 or: Housing and Urban Development regional office
PRINTED INFORMATION AVAILABLE	The Workable Program for Community Improvement
AUTHORIZING LEGISLATION	Housing Act of 1949 as amended, Title I; P.L. 81-171; 68 STAT 413; 42 USC 1451 (1952) Housing Act of 1964 as amended; P.L. 88-560; 78 STAT 769, 790; 42 USC 1452b Housing and Urban Development Act of 1965.

Programs of the U.S. Department of Agriculture

PROGRAM TITLE	PAYMENTS TO COUNTIES, NATIONAL GRASSLANDS, AND LAND UTILIZATION PROJECTS
NATURE AND PURPOSE OF PROGRAM	At the end of each calendar year, this program provides eligible counties with 25 percent of the revenues derived from use of submarginal lands.
WHO CAN APPLY	All counties are eligible if they meet the condition that funds be used for school or road purposes, or both.
FOR INFORMATION CONTACT	U. S. Forest Service U. S. Department of Agriculture Washington, D. C. 20250 or: Regional Foresters Field Units U. S. Forest Service
PRINTED INFORMATION AVAILABLE	
AUTHORIZING LEGISLATION	Act of July 22, 1937, 50 STAT 526.

PROGRAM TITLE	PAYMENTS TO STATES WITH NATIONAL FORESTS
NATURE AND PURPOSE OF PROGRAM	This program provides for annual payments to states in which national forests are located. The payment consists of 25 percent of all money received from the national forest in the state during the fiscal year. The funds for each fiscal year may be used as the state legislature prescribes for the public schools and roads of the county or counties in which the national forests within the state are located.
WHO CAN APPLY	State or territory in which the national forest is situated, for benefit of public schools and public roads of the county or counties in which the national forest is situated.
FOR INFORMATION CONTACT	U. S. Forest Service U. S. Department of Agriculture Washington, D. C. 20250 or: Regional Foresters Field Units U. S. Forest Service
PRINTED INFORMATION AVAILABLE	
AUTHORIZING LEGISLATION	Act of May 23, 1908, 35 STAT 260, and Section 13 of the Act of March 1, 1911, 36 STAT 961, as amended by Acts of June 30, 1914, 38 STAT 441; September 21, 1944, 58 STAT 737; and April 24, 1950, 64 STAT 87, 16 USC 500.

Programs of the U.S. Department of Defense

PROGRAM TITLE

LIMITED WATER RESOURCES DEVELOPMENT PROJECTS

NATURE AND PURPOSE OF PROGRAM

These programs provide general authority to the Chief of Engineers to undertake flood control, navigation, and beach erosion control projects of limited scope.

For the non-Federal interests, cooperation is based on the same requirements as for regularly authorized projects and in addition assume the following, as appropriate: (1) Small Flood Control Projects - all project costs in excess of the Federal limit of $1 million, (2) Small Navigation Projects - all project costs in excess of the Federal limit of $500,000, (3) Small Beach Erosion Control Projects - all project costs in excess of the Federal limit of $500,000, (4) Snagging and Clearing Projects for Flood Control - all project costs in excess of the Federal limit of $100,000, and (5) Protection of Essential Highways, Highway Bridge Approaches, and Public Works - all project costs in excess of the Federal limit of $50,000.

WHO CAN APPLY

State and local government officials should consult the nearest District Engineer who may undertake investigations and construction if the project is feasible and can be funded within the appropriated funds.

FOR INFORMATION CONTACT

Director of Civil Works
Office of the Chief of Engineers
Department of the Army
Washington, D. C. 20315

or: U. S. Army District Engineers

PRINTED INFORMATION AVAILABLE

Information sheets describing these programs are available from the nearest District Engineer.

AUTHORIZING LEGISLATION

P.L. 80-858, Section 205 as amended (Flood Control);
P.L. 86-645, Section 107 as amended (Navigation);
P.L. 87-874, Section 103 as amended (Beach Erosion);
P.L. 75-406, Section 3 as amended (Snagging and Clearing);
P.L. 79-526, Section 14 (Bank Protection).

PROGRAM TITLE	NAVIGATION IN RIVERS AND HARBORS
NATURE AND PURPOSE OF PROGRAM	This program provides for planning and construction to improve rivers and harbors for navigation. Non-Federal interests must provide the necessary lands, easements, and rights-of-way; and they are required to relocate or alter utilities, provide and maintain public terminals and berthing areas, and hold and save the United States free from damages due to the construction works. Special contributions may be required for single-user projects and for projects where land enhancement results from spoil disposal. Where bridges obstruct navigation, alterations are financed cooperatively. For small boat harbors, non-Federal interests contribute 50 percent of the first cost for the general navigation facilities allocated to recreational boating. Maintenance of general navigation features is at Federal expense.
WHO CAN APPLY	State and local officials, after consulting the nearest District Engineer, may request authorization of surveys through their senators or congressmen. Federal funding of planning and construction projects requires specific congressional authorization.
FOR INFORMATION CONTACT	Director of Civil Works Office of the Chief of Engineers Department of the Army Washington, D. C. 20315 or: U. S. Army District Engineers
PRINTED INFORMATION AVAILABLE	Survey Investigations and Reports - General Procedures, Engineer Manual No. 1120-2-101 Benefit Evaluation and Cost-Sharing for Small-Boat Harbor Projects, Engineer Manual No. 1120-2-113 Numerous regulations relating to various aspects of the navigation program
AUTHORIZING LEGISLATION	Rivers and Harbors Acts beginning in 1824.

Programs of the U.S. Department of Interior

PROGRAM TITLE	AMERICAN INDIANS -- CONSTRUCTION OF RESERVATION ROADS AND BRIDGES
NATURE AND PURPOSE OF PROGRAM	This program provides planning, engineering, construction, repair, and reconstruction of Indian reservation roads and bridges that are located within an Indian reservation or that provide access to an Indian reservation or Indian land, and that are jointly designated by the Secretary of Interior and the Secretary of Commerce as a part of the Indian Bureau road system. In addition, assistance is given to roads and bridges which have suffered serious damage as the result of disaster over a wide area, such as floods, hurricanes, tidal waves, earthquakes, severe storms, landslides, or other catastrophes.
WHO CAN APPLY	Requests for projects on the reservation are not limited to any person or organization. Final requests for emergency relief are submitted to the Bureau of Public Roads by the Bureau of Indian Affairs.
FOR INFORMATION CONTACT	Bureau of Indian Affairs U. S. Department of Interior Washington, D. C. 20242 or: Superintendent of Indian agency or area director
PRINTED INFORMATION AVAILABLE	None
AUTHORIZING LEGISLATION	Act of May 26, 1928; 45 STAT 750; 72 STAT 885.

PROGRAM TITLE

REAL PROPERTY FOR RESIDENTIAL, COMMERCIAL, AGRICULTURAL, INDUSTRIAL, OR PUBLIC USES OR DEVELOPMENT

NATURE AND PURPOSE OF PROGRAM

This program provides for transfer of title of Federal lands that are required for orderly growth and development of a community or are chiefly valuable for residential, commercial, agricultural (exclusive of lands chiefly valuable for grazing and raising forage crops), industrial, or public uses or development. Federally owned public domain land may be available for use, lease or purchase to qualified governmental agencies at the appraised fair market value; sales to qualified individuals are made through competitive bidding.

Various authorizations and statutes apply including:

- Special Land Use Permits
- Small Tract Act
- Recreation and Public Purposes Act
- Rights-of-Way for Highways
- Free Use Permits for Mineral Materials
- Airports and Aviation Fields Act (1928)
- Leases, Permits, and Easements for Public Works
- Public Land Sales Act
- Townsites
- Historic Sites and Surveys

WHO CAN APPLY

State and local governmental agencies, individuals, corporations, and associations are eligible.

Information regarding eligibility should be obtained from the Bureau of Land Management.

FOR INFORMATION CONTACT

Bureau of Land Management
U. S. Department of the Interior
Washington, D. C. 20240

PRINTED INFORMATION AVAILABLE

Publications are available by letter request through:
regional offices of Department of Interior

Fact Sheet on Historical Preservation
Fact Sheet on Land and Water Conservation
Federal Assistance in Outdoor Recreation

AUTHORIZING LEGISLATION

Public Sale Act of 1964; P.L. 88-608; 78 STAT 988.

Programs of the Federal Power Commission

PROGRAM TITLE	WATER CONSERVATION ASSISTANCE
NATURE AND PURPOSE OF PROGRAM	The Federal Power Commission may investigate the occupancy of, or intention to occupy, public lands, reservations, or streams and other bodies of water over which Congress has jurisdiction for the purpose of developing electric power. The Commission may issue appropriate orders to conserve and use the navigation and water resources of a region.
WHO CAN APPLY	Interested or affected parties may petition the FPC to intervene in cases involving water conservation.
FOR INFORMATION CONTACT	Office of Public Information Federal Power Commission Washington, D. C. 20426
PRINTED INFORMATION AVAILABLE	None
AUTHORIZING LEGISLATION	Federal Power Act; 16 USC 792-825r.

PROGRAM TITLE	WATER RESOURCES DEVELOPMENT
NATURE AND PURPOSE OF PROGRAM	The Federal Power Commission has diverse responsibilities for conserving and developing the nation's water resources. Principal among these is the issuance of preliminary permits for studies of potential hydroelectric projects, and the issuance of licenses, limited to 50 years, for the construction and operation of non-Federal hydroelectric projects. The Commission may condition licenses for protection of life, health, and property; flood control; navigation; recreation; scenic beauty; and fish and wildlife. FPC studies, collects and records data on the water power industry, water power sites, and the use of water resources of any region to be developed.
WHO CAN APPLY	Interested or affected parties may request the aid of the Federal Power Commission to intervene in cases involving water resource development.
FOR INFORMATION CONTACT	Office of Public Information Federal Power Commission Washington, D. C. 20426
PRINTED INFORMATION AVAILABLE	Various river basin studies are available.
AUTHORIZING LEGISLATION	Federal Power Act; 16 USC 792-825r.

Programs of the General Services Administration

PROGRAM TITLE

DONATION OF FEDERAL SURPLUS PERSONAL PROPERTY

NATURE AND PURPOSE OF PROGRAM

This program provides surplus personal property for educational, public health, civil defense, and public airport purposes. This property is no longer needed by the Federal government and may include vehicles, office machines, hardware, scientific and electronic equipment, machine tools, and many other items that can be used for approved public purposes.

WHO CAN APPLY

Surplus personal property may be donated by the Administrator of General Services to:

1. Tax-supported or tax-exempt universities, colleges, schools, educational radio or TV stations, schools for the mentally retarded or physically handicapped, and public libraries
2. Tax-supported or tax-exempt hospitals, health centers, medical institutions, and clinics
3. Civil defense organizations
4. Service educational activities, including American Red Cross, Boy Scouts of America, Boys Clubs of America, Camp Fire Girls, Civil Air Patrol, Girl Scouts of America, Naval Sea Cadet Corps, schools with military-connected programs
5. Public airports
6. Public parks and recreational facilities.

FOR INFORMATION CONTACT

Property Management and Disposal Service
General Services Administration
Washington, D. C. 20405

or: Regional Director
Property Management and Disposal Service
General Services Administration

PRINTED INFORMATION AVAILABLE

Donation of Federal Surplus Personal Property

AUTHORIZING LEGISLATION

Federal Property and Administrative Services Act of 1949; P.L. 81-152; 63 STAT 377; 5 USC 124-132 note, 133y-16 note, 630-630h; 40 USC 471-475, 481, 483, 484-492; 41 USC 5, 251-255, 257-260; 44 USC 391; 50 USC 1622, 1641.

Programs of the Interstate Commerce Commission

PROGRAM TITLE	FEDERAL-STATE HIGHWAY TRANSPORTATION COOPERATIVE ECONOMIC LAW ENFORCEMENT AGREEMENTS
NATURE AND PURPOSE OF PROGRAM	The purpose of this program is to make cooperative agreements between the states and the Federal government in the enforcement of economic laws concerning highway transportation. Under this program, a state may obtain assistance from the United States in the administration, investigation, and enforcement of highway transportation laws. The Interstate Commerce Commission may lawfully give a state information which comes to the Commission's attention through investigation. Annual and periodic reports are filed with the Commission by carriers subject to ICC jurisdiction. These reports include compilations of statistical data on domestic water and rail carriers, research reports on domestic surface transportation, and Commission publications--all of which are useful for trend analysis, economic development, and other planning purposes.
WHO CAN APPLY	States and state public utility commissions are eligible.
FOR INFORMATION CONTACT	Secretary, Interstate Commerce Commission Washington, D. C. 20423
PRINTED INFORMATION AVAILABLE	Rules will be published in the Federal Register. Publications include the types mentioned above.
AUTHORIZING LEGISLATION	P.L. 89-170 (Section 1); 49 USC 305f.

PROGRAM TITLE	VETERANS' AUTOMOBILE GRANTS
NATURE AND PURPOSE OF PROGRAM	This program provides financial assistance not to exceed $1600 for the purchase of an automobile for veterans of WW II and the Korean conflict who have a service-connected disability of loss, or loss of use of, one or both hands, one or both feet, or severe impairment of vision of both eyes. This is a one-time grant to an eligible veteran.
WHO CAN APPLY	To be eligible, a veteran must have a service-connected disability of loss, or loss of use of, one or both hands, one or both feet, or severe impairment of vision of both eyes resulting from WWII, Korean or Viet Nam conflict service. Generally, veterans must apply within 5 years from date of release from active duty, but there are several specific exceptions to this time limit
FOR INFORMATION CONTACT	Veterans Administration Washington, D. C. 20420 or: Any Veterans Administration office
PRINTED INFORMATION AVAILABLE	Federal Benefits for Veterans and Dependents, VA Fact Sheet IS-1 (20¢ Available from: Superintendent of Documents U. S. Government Printing Office Washington, D. C. 20402
AUTHORIZING LEGISLATION	38 USC 1901-5.

APPENDIX C

EXISTING PLANS AND PROGRAMS OF PUBLIC AGENCIES FOR TRANSPORTATION IMPROVEMENTS IN PENNSYLVANIA

SIGNIFICANCE AND NATURE OF EXISTING PLANS IN PENNSYLVANIA

Any new statewide transportation plan must recognize those transportation-related projects and programs which are already underway. The Interim Master Plan must, in many cases, tack desired components onto development projects, funding programs, and the existing plans of established organizations. In some instances where funds are already committed to transportation projects, there will be little that a PennDOT can do to alter or direct activities. At any rate, a PennDOT administration must be aware of the bounds and limits within which it can operate and take steps to reach its goals and objectives accordingly. Appendix C delineates some appropriate limitations and opportunities for PennDOT action.

The sources of significant transportation-related plans and programs in Pennsylvania can be divided into two groups:

1. State government agencies and state sponsored authorities.
2. Local government agencies and locally sponsored, non-profit authorities.

There are also significant transportation-related plans made by private, profit-making organizations which have an interface with the above-mentioned groups. However, the different orientation of private organizations warrants a special treatment which is given in Appendix D. Additionally it is recognized that many of the state and local plans are tied to federal funding programs mentioned in Appendix B. Since the programs and projects of public agencies are so numerous, complex, and widespread, a special regional treatment of their significant transportation activities appears as a supplement, Appendix C-1. This supplement deals primarily with highway construction in Pennsylvania.

STATE GOVERNMENT AGENCIES AND AUTHORITIES

The Pennsylvania State Agencies and authorities which now have the greatest impact on transportation in the state are:

1. The Pennsylvania Department of Highways
2. The Bureau of Community Development, Department of Community Affairs
3. The Pennsylvania State Planning Board
4. The Department of Commerce
5. Department of Forests and Waters
6. Department of Military Affairs
7. Pennsylvania Turnpike Commission
8. The Public Utilities Commission
9. Various commissions such as the Pennsylvania Aeronautics Commission

PLANS OF THE DEPARTMENT OF HIGHWAYS

Introduction

The Federal Aid Highway Act made available, in 1956, funds for use by State Highway Departments in planning and constructing Interstate Highways and for building and improving primary or secondary roads. The costs of interstate projects (including planning and management of right-of-way acquisition) are matched on a 90 percent federal, 10 percent state basis. Direction came from the Bureau of Public Roads on the routing of interstate highways. However, the planning of improvement and construction of non-interstate roads was left to the State Highway Departments. The Bureau of Public Roads (BPR) asked only for justification of proposed federally aided non-interstate projects according to a needs/cost formula, which BPR furnished in order to qualify for 50-50 matching funds.

The Pennsylvania Department of Highways, recognizing the significance of the opportunities provided, set out to devise a "Six-Year Program" to improve the roadway network in the state. The first "Six-Year Program" was for the period July 1, 1965 to June 30, 1971. The proposed projects had a total value of $3.4 billion. A second "Six-Year Program" has recently been outlined for the period July 1, 1967 to July 1, 1973 (See *Six-Year Improvement Program, July 1, 1967 - June 30, 1973,* Volumes 1 and 2, Commonwealth of Pennsylvania, Department of Highways).

The add-on to the original "Six-Year Program" consists of planning, engineering, and construction projects totaling $1.35 billion for the period July 1, 1971 to July 1, 1973. The projects in the most recent Plan are those screened from over 8,500 proposals which come from various parts of the State and from the State Highway Department's Bureau of Advance Planning. Many proposed projects came from civic groups, planning agencies, associations, industrial leaders and concerned citizens who attended hearings to express their opinions. Had all 8,500 proposed projects been undertaken, the total cost would have been $13 billion.

In addition to the above mentioned projects for expanding the capacities of Pennsylvania's highways, several other projects were recommended by the Highway Commission for inclusion in the "Six-Year Program." Those added projects constitute a "Safety Improvement Sub-Program" (See *Six-Year Improvement Program, July 1, 1967 - June 30, 1973*, Volume 3, Commonwealth of Pennsylvania, Department of Highways). The safety-related projects apply to improving driving conditions at:

1. Accident cluster locations.
2. Hazardous school bus routes.
3. Other hazardous locations recommended by the district engineer.

The total estimated cost of the safety improvement program is $120 million.

Of the total $4.9 billion funds requirement for carrying out the new "Six-Year Program," about $4 billion, will almost certainly be available in the form of highway user revenues, anticipated federal aid, and borrowing capacity which has been authorized by the State legislature (Highway

User Taxes cannot be spent for other than highway improvements in Pennsylvania). The State Highway Commission has proposed that the additional $900 million be obtained by increasing auto registration by $20 per year, adding 50% to truck registration fees, and by borrowing $600 million. The $600 million could be borrowed after June 30, 1971, when the State Highway and Bridge Authority Act will again allow the State to add to its debt obligation for road construction and improvements.

While the most recent "Six-Year Plan" is ambitious (See Figure 3-2b), it still is not adequate to meet the roadway needs of the state. The State Highway Commission estimates that total needed highway improvement work (according to the BPR formula) would cost about $23 billion by mid 1972. Additional needs brought about by increased population would likely bring the total improvement needs to a total cost of about $32 billion (See *1972 to 1985 Highway Needs Study for Pennsylvania*, Commonwealth of Pennsylvania, Department of Highways, February, 1967). Of the $32 billion about $29 billion would be required to relocate and reconstruct existing roads. Furthermore, the calculated needs apply only to the 43,481 miles of state-owned highways. The needs of 62,000 miles of locally-owned streets and roads in the state would doubtlessly need improvements also. This can only lead to the conclusion that there will be a continuing shortage of funds to improve the highway network in the foreseeable future and that we will be traveling over less than optimum highways in the state for many years to come. Perhaps our criteria for determining highway needs will have to be changed, or we will have to develop more efficient means of satisfying the complex demands for travel.

As a minimum, there will be needs for capacity improvements by 1975 on major highway links shown in Figure 3-2a. These are the links identified by FIRL as showing high probability of demand exceeding capacity, measured under desirable conditions by 1975 (*Preliminary Analysis of Intercity Transportation Demand in Pennsylvania to 1975*, The Franklin Institute Research Laboratories, March 1968). Hopefully, the projects outlined in the Second Six-Year Highway Improvement Program will improve most expected capacity deficiencies sufficiently to meet 1975 demands. Table C-1a lists 285 projects from the Second Six Year Program which should relieve some of the congestion on the links identified by FIRL as likely to be capacity deficient. The listing (in Table C-1a) is organized by thirteen regions in the State (See Figure 2-1). It is apparent that the major needs for highway capacity improvements will come where population densities are high and where suburbia is spreading to the counties (See Figure 3-5), *i.e.*, in the Philadelphia Area and in the Pittsburgh Area (Region 1 and 12 respectively). Just those Six Year Program activities which would be directed toward meeting the greatest capacity improvements needs (as identified by FIRL) would cost about $1.5 billion (See Table C-1a). Improvements, above and beyond those scheduled, will likely be needed before 1975 on capacity deficient links included in the Six Year Program. Also capacity improvements will be needed on links not included in the Six Year Program (See Table C-1b for identified links). Some 587 miles of links identified as "likely to be capacity deficient by 1975" by FIRL were not included in the Second Six Year Plan.

Obviously, the needs for highway construction in Pennsylvania are too complex to assume that only the needed capacity improvements identified by

TABLE C-1a

Improvements Which Could Help Relieve Identified Capacity Deficiencies

LINK NO.	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
03	77	Philadelphia	T.R.I-676	Upgrading the Approaches to Walt Whitman Bridge 26th St. to Toll Booths	Multilane Divided	2.9	39.6
302	17	Chester	T.R.30	Lancaster Co. Line to Coatesville By-Pass	Widen to 52' L.R.142(34) 0-122	2.0	0.3
304	18	Chester	T.R.30	Downingtown By-Pass to Malvern	Widen to 52' L.R.142(30) 903-1115 L.R.142(30) 1138-1279	6.6	1.0
	24	Chester	T.R.30	Coatesville - Downingtown By-Pass to Relocated T.R.202	4 Lane Divided Relocation L.R.1004	5.0	7.9
30	154	Chester	T.R.1	Oxford By-Pass T.R.1 Relocated near T.R.272 to T.R.472	4 Lane Divided Relocation	1.9	2.4
	155	Chester	T.R.1	Maryland State Line to Oxford By-Pass	Widen to 48' L.R.131 0-211	4.2	2.8
	158	Chester	T.R.1	T.R.1 Relocated T.R.472 to T.R.896 Vicinity of Oxford	4 Lane Divided Relocation L.R.1025(2)	5.2	5.7
317	5	Bucks	T.R.1	Woodbourne to L.R.09021	4 Lane Divided Relocation L.R.281Par 384-531	2.6	2.1
	6	Bucks	T.R.1	L.R.09021 to Toll Plaza	4 Lane Divided Relocation L.R.281Par 531-692	3.1	4.2
324	55	Montgomery	T.R.422	Trappe to Pottstown	Widen to 44' L.R.146(14) 526-937	7.4	1.8
	71	Montgomery	T.R.422	SE. of Phoenixville L.R.46063 to T.R.29	4 Lane Divided Relocation L.R.1046(3) L.R.1116(1)	4.4	6.4
	72	Montgomery	T.R.422	Betzwood Bridge to L.R.46063 SE. of Phoenixville	4 Lane Divided Relocation L.R.1046 61-206	2.6	5.2
	73	Montgomery	T.R.422	L.R.46015 to T.R.29	4 Lane Divided Relocation L.R.1046(4) 298-520	4.2	4.6
	181	Montgomery	T.R.422	Evansburg Project 1969 L. Providence Twp.	4 Lane Divided Relocation	1.2	0.0
	184	Montgomery	T.R.422	Ridge Pike L.R.46123 to L.R.463 Trooper Rd to Park Ave.	Widen and Resurface to 48' L.R.146 162-186	0.4	0.4
327	70	Montgomery	T.R.I-476	Mid County Expressway L.R.46109 to U.S.422	6 Lane Divided Relocation L.R.1010(D3) 1175-1252	1.4	6.2
	192	Montgomery		Mid-County Expressway Toll Conn. to Pa. Tpk.	Multi-Lane Expressway L.R.1010	1.0	5.4
	198	Montgomery		Plymouth Rd - Flowertown Rd. L.R.145 to Co. Rd.	Reconstruct to 48' L.R.46087 91-155	1.2	1.1
361	156	Chester	T.R.41	S.E. of Avondale - L.R. 15036 to Delaware State Line	Widen to 48' L.R.215 L.R.215 852-966	2.2	1.7
	161	Chester		T.R.41 to T.R.1 Reloc. New Garden Twp. Vicinity of Avondale	Reconstruct to 48' L.R.15036 72-175	2.0	2.3
369	26	Chester	T.R.100	T.R.100 Connection to L.R.1042(4)	4 Lane Divided Relocated L.R.1060(1) 35-111	2.2	1.6
370	19	Chester	T.R.100	Pottstown Pike T.R.30 To Turnpike Entrance	Widen to 48' L.R.147(17) 268-480	4.0	1.9
368	117	Philadelphia		Sixteenth St.	Widen Additional 20' L.R.67006Par 0-16	0.5	1.2
	118	Philadelphia		Fifteenth St.	Widen Additional 20' L.R.67006Par 0-16	0.5	1.4
401	57	Montgomery	T.R.611	Ogontz Ura	Reconstruct to 48' L.R.197 131-157	0.5	0.5

LINK NO.	PROJ. NO.	COUNTY	ROUTE	LOCATION	L. R. STATIONS	MILES	Millions
403	14	Bucks	T.R.611	Doylestown By-Pass	4 Lane Divided Relocation L.R.1066(1) 0-250	4.5	9.6
410	146	Bucks	T.R.532 T.R.413	Newtown By-Pass T.R.413 to T.R.532	2 Lane Relocation 4 Ln R/	3.0	3.0
411	194	Montgomery	T.R.202	Norristown to T.R.73 T.R.202 Relocated	4 Lane Divided Relocation L.R.1086	7.6	7.8
413	189	Montgomery	T.R.202	Dekalb Street Lafayette to Airy Norristown CBD	Reconstruct to 48' L.R.225 264-275	0.2	0.4
414	182	Montgomery	T.R.202	T.R.73 to T.R.63 T.R.202 Relocated	4 Lane Divided Relocation	4.3	9.5
415	16	Bucks	T.R.202	T.R.152 to Doylestown By-Pass	4 Lane Divided Relocation L.R.1065	4.0	5.3
	183	Montgomery	T.R.202	T.R.63 to T.R.152 T.R.202 Relocated	4 Lane Divided Relocation	4.4	7.4
416	13	Bucks	T.R.202	Doylestown By-Pass	4 Lane Divided Relocation L.R.1062	4.0	6.4
	147	Bucks	T.R.202	Relocated T.R.202 L.R.09064 to T-398 Buckingham Solebury Twp.	4 Lane Divided Relocation	4.4	10.5
417	15	Bucks	T.R.202	New Hope to Lambertville Toll Bridge Approach	4 Lane Divided Relocation L.R.1066SP	1.7	1.5
	149	Bucks	T.R.202	Relocated T.R.202 T-398 to New Jersey Line	4 Lane Divided Relocation L.R.155 639-872	5.0	7.9
433	111	Philadelphia	T.R.I-695	Cobbs Creek Expressway L.R.795 to Warrington Ave.	6 Lane Divided Relocation L.R.1019 155-434	5.3	100.1
	175	Delaware		Lansdowne Expressway Lansdowne Ave. to Cobbs Creek	6 Lane Divided Relocation L.R.1077 245-345	1.9	15.2
440	67	Montgomery	T.R.I-476	Mid County Expressway I-76 to Bridge	6 Lane Divided Relocation L.R.1010(C4) 892-913	0.4	2.5
	68	Montgomery	T.R.I-476	Mid County Expressway Schuylkill River Bridge	6 Lane Divided Relocation L.R.1010(D1) 1038-1068	0.6	6.5
	201	Montgomery		Conshohocken Road Ridge Pike to New Sec.	Reconstruct to 48' L.R.46107 67-167	1.9	1.9
441	45	Delaware	T.R.I-476	Mid-County Expressway Conestoga Rd. to Co. Line	6 Lane Divided Relocation L.R.1010 675-750	1.5	13.6
	65	Montgomery	T.R.I-476	Mid-County Expressway Montgomery Co. Line to I-76	6 Lane Divided Relocation L.R.1010(C2) 750-829	1.5	6.7
	66	Montgomery	T.R.I-476	Mid County Expressway Schuylkill Expressway Interchange	Interchange L.R.1010(C3) 829-892	1.2	12.6
443	42	Delaware	T.R.I-476	Mid-County Expressway Beatty Rd. to Sproul Rd.	6 Lane Divided Relocation L.R.1010 265-352	1.7	7.4
	43	Delaware	T.R.I-476	Mid-County Expressway Sproul Rd. to Lawrence Rd.	6 Lane Divided Relocation L.R.1010 352-460	2.2	5.3
	44	Delaware	T.R.I-476	Mid-County Expressway Lawrence Rd. to Darby Rd.	6 Lane Divided Relocation L.R.1010 460-538	1.5	6.5
445	39	Delaware	T.R.I-476	Mid-County Expressway I-95 to U.S.13-By-Pass	6 Lane Divided Relocation L.R.1010 20-97	0.6	6.6
	40	Delaware	T.R.I-476	Mid-County Expressway U.S.13 By-Pass to U.S.1	6 Lane Divided Relocation L.R.1010 97-190	1.6	10.7
	41	Delaware	T.R.I-476	Mid-County Expressway U.S.1 to L.R.23031	6 Lane Divided Relocation L.R.1010 190-268	1.6	10.6

Region 1 (Cont.)

[illegible]	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
C	36	Delaware	T.R.I-95	Delaware Expressway Ridley Creek to Darby Creek	4 Lane Divided Relocation L.R.795(A) 10-118	2.0	17.8
	37	Delaware	T.R.I-95	Delaware Expressway Darby Creek to I-695	4 Lane Divided Relocation L.R.795(A) 118-200	1.7	15.7
	38	Delaware	T.R.I-95	Delaware Expressway I-695 to Enterprize Ave.	8 Lane Divided Relocation L.R.795(B) 200-448 L.R.795(B) 0- 10	4.9	36.5
	80	Philadelphia	T.R.I-95	Delaware Expressway 2,200' South of Broad St. to 11th St.	8 Lane Divided Relocation L.R.795AH. L.R.1000 129-152	0.7	10.0
	81	Philadelphia	T.R.I-95	Delaware Expressway Enterprise Ave. Interchange	8 Lane Divided Relocation L.R.795AH. 10-35	0.5	8.8
	83	Philadelphia	T.R.I-95	Delaware Expressway South Approach to Schuylkill River Bridge	8 Lane Divided Relocation L.R.795AH. 35-58	0.4	8.8
	84	Philadelphia	T.R.I-95	Delaware Expressway Main Span Schuylkill River Bridge	Bridge Relocation L.R.795AH. 58-110	1.0	22.9
	86	Philadelphia	T.R.I-95	Delaware Expressway North Approach to Schuylkill River Bridge	8 Lane Divided Relocation L.R.795AH. 110-12[illegible]	0.4	5.8

[illegible]	NO.	COUNTY	ROUTE	LOCATION	L. R.	STATIONS	MILES	Millions
	79	Lehigh	T.R.29 T.R.22	Interchange with L.R.163 T.R.29	Interchange L.R.163 L.R.771	 40-44 216-220		1.0
	81	Lehigh	T.R.22	Interchange with L.R.39040	Redesign Interchange L.R.771	 154		1.0
	82	Lehigh	T.R.22	Interchange with T.R.987	Redesign Interchange L.R.771	 467		2.4
32	12	Berks	T.R.422	E. of Womelsdorf to W. of Sinking Springs	4 Lane Divided Relocation L.R.1109		8.5	6.5
	13	Berks		State Hill Rd Underpass Boro of Wyomissing	Hazard Elimination L.R.06038(3)	 0-13	0.2	0.4
	68	Berks	T.R.724	Lincoln Park Road Shillington to Sinking Springs	Reconstruct to 33' L.R.06072	 0-136	2.6	0.9
33	63	Berks	T.R.422	Douglassville By-Pass	Widen to 48' L.R.146 L.R.146 PAR	 97-176 596-673	1.5	0.9
20	3	Berks	T.R.222	Kutztown By-Pass	4 Lane Divided Relocation L.R.157(25)		4.6	3.7
	4	Berks	T.R.222	Reading to Maiden Creek	Widen to 48' L.R.157(22)	 174-439	5.0	1.8
	5	Berks	T.R.222	Maiden Creek-Kutztown	Widen to 48' L.R.157(23)	 439-544	7.7	2.5
	6	Berks	T.R.222	Kutztown to Lehigh County Line	Widen to 48' L.R.157(24)	 917-1159	4.6	1.1
	21	Lehigh	T.R.222	Berks County Line to Wescosville	Widen to 48' L.R.157(30)	 0-420	9.0	4.7
	67	Berks	T.R.222	Reading Outer Loop T.R.61 to T.R.222	4 Lane Divided Relocation L.R.1035	 264-357	3.5	3.9
35	1	Berks	T.R.222	Lancaster Co. Line to L.R.06076	Widen to 48' L.R.148	 0-210	4.0	2.7
	2	Berks	T.R.222	L.R.06076 to Shillington	Widen to 48' L.R.148	 210-326	1.9	0.6
	11	Berks	T.R.222	Lower Connection to Warren Street City of Reading	4 Lane Divided Relocation L.R.1075		3.7	7.2
	66	Berks	T.R.222	Reading Outer Loop T.R.222 to U.S.422	4 Lane Divided Relocation L.R.1035		5.4	9.7
350	7	Berks	T.R.61	One Mile N. of Reading to Tuckerton	Widen to 48' L.R.160(17) L.R.160(17)	 100-119 167-243	1.8	1.5
	8	Berks		Warren Street Extension City of Reading	4 Lane Divided Relocation L.R.794		2.3	4.0
	9	Berks	T.R.222	Reading Outer Loop T.R.422 to Tulpehocken Creek Bridge	4 Lane Divided Relocation L.R.1035		3.7	3.2
	10	Berks	T.R.422	Reading Outer Loop Tulpehocken Creek Bridge to Warren Street By-Pass	4 Lane Divided Relocation L.R.1035SF		2.2	3.8
	14	Berks	T.R.422	Warren Street By-Pass Boro of Wyomissing	Widen to 48' L.R.06150(4) L.R.06150SE	 0-60 0-32	1.5	0.7
	15	Berks	T.R.422	Warren Street By-Pass City of Reading	Convert to Limited Access L.R.06150(4)	 60-94	0.6	0.4

LINK NO.	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R.	STATIONS	MILES	COST Millions
[illegible]	29	Lehigh	T.R.29	Berks County Line to Two Mi. South of Emmaus	Widen to 48' L.R.1060	 0-253	4.6	4.9
	30	Lehigh	T.R.29	L.R.158 Spur to Emmaus	Widen to 48' L.R.1060	 253-321	1.3	1.5
	64	Berks	T.R.29 T.R.100	Boyertown to Lehigh Co. Line	Widen to 48' L.R.158 L.R.284	 75-114 471-656	9.2	12.4
[illegible]	78	Lehigh		Vicinity of Allentown Emmaus to T.R.309	Widen to 48' L.R.158	 390-477	1.7	1.5
[illegible]	83	Lehigh	T.R.309	T.R.309 By-Pass Lehigh Street Interchange	Add Additional Ramps L.R.781(5) L.R.159(11)	 220-250 460-500		0.6
[illegible]	22	Lehigh	T.R.29 T.R.309	Allentown By-Pass to Guthsville	Reconstruct to 48' L.R.163(24)	 225-275	0.9	0.5
[illegible]	38	Northampton	T.R.611	Relocated T.R.611 T.R.22 to I-78	4 lane Divided Relocation L.R.1096		3.2	6.6
	96	Northampton	T.R.611	Relocated T.R.611 I-78 to Bucks Co. Line	4 lane Divided Relocation L.R.1098		4.5	7.3

Region 3

LINK NO.	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
332	33	Monroe	T.R.209	Brodheadville to Sciota	4 Lane Divided Relocation L.R.164		3.8
	85	Monroe	T.R.209	T.R.209 Relocated Carbon Co. Line to Brodheadsville	2 Lane Relocation 4 Ln Row	7.4	4.1

Region 4

LINK NO.	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
123	1	Bradford	T.R.220	Towanda By-Pass South Towanda to North Towanda	2 Lane Relocation 4 Ln Row L.R.1058 756-1046	5.5	1.4
	43	Bradford	T.R.220	Completion of Towanda By-Pass	2 Lane Relocation 4 Ln Row L.R.1098	2.5	6.5
130	41	Bradford	T.R.6 T.R.309	L.R 08026 to T.R.187	Add Climbing Lane L.R.241 0- 241	4.6	2.9
	42	Bradford	T.R.6 T.R.309	T.R.409 to L.R.08026	Add Climbing Lane L.R.241 241- 383	2.7	1.9
[illegible]	3	Bradford	T.R.309	Athens-Sayre By-Pass Greens Landing to N.E. Bank of Chemung River	2 Lane Relocation L.R.1097(1) 0- 158	3.0	2.7
	4	Bradford	T.R.309	Athens-Sayre By-Pass N.E. Bank of Chemung River N.Y. State Line	2 Lane Relocation L.R.1097(2) 158- 274	2.0	1.8

Region 5

	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
[illegible]	48	Lackawanna	T.R.6	Scranton - Carbondale Expressway E. Bank of Lackawanna	4 Lane Divided Relocation	1.2	3.7
	49	Lackawanna	T.R.6	Scranton - Carbondale Expressway L.R.168 Ext. to T.R.247	4 Lane Divided Relocation	3.5	6.4
	50	Lackawanna	T.R.6	Carbondale By-Pass	4 Lane Divided Relocation	3.7	7.5
	51	Lackawanna		Brooklyn St. By-Pass City of Carbondale	2 Lane Relocation 4 Ln Row	1.2	0.7
[illegible]	43	Schuylkill	T.R.209	Fort Carbon to Pottsville	Widen to 48' L.R.162 17-149	2.5	1.1
	44	Schuylkill	T.R.209	Port Carbon to L.R.53098	Widen to 48' L.R.162 149-288	2.7	1.0
	45	Schuylkill	T.R.209	L.R.53098 to L.R.53016	Widen to 48' L.R.162 288-643	7.1	3.2
	46	Schuylkill	T.R.209	L.R.53016 to Tamaqua	Widen to 48' L.R.162 643-864	4.3	1.7
	54	Schuylkill	T.R.209	Pottsville By-Pass York Form Junc. to T.R.61	4 Lane Divided Relocation L.R.1103	3.0	4.4
	55	Schuylkill	T.R.209	Pottsville By-Pass T.R.61 to Blyth Twp. Line	4 Lane Divided Relocation L.R.1103	3.7	5.1
	20	Luzerne	T.R.11	Berwick By-Pass Col. Co. to Beach Haven	2 Lane Relocation	4.0	1.2
	28	Luzerne		Plymouth to Luzerne L.R.40132 to L.R.11 Ext	4 Lane Divided Relocation L.R.1085 12- 226	4.1	4.3
	30	Luzerne	T.R.309	Cross Valley Expressway T.R.315 to Penn Ave	4 Lane Divided Relocation L.R.1052(3) 205- 281	1.4	9.5
[illegible]	31	Luzerne	T.R.309	Cross Valley Expressway Penn Ave. to Kingston By-Pass	4 Lane Divided Relocation L.R.1052(2) 150- 205	1.0	5.3
	32	Luzerne	T.R.309	Cross Valley Expressway Kingston By-Pass to Luzerne	4 Lane Divided Relocation L.R.1052(1) 15- 150	2.5	8.9

LINK NO.	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
71	26	Dauphin	T.R.I-81	Anthracite Expressway L.R.22021 to Linglestown	4 Lane Divided Relocation L.R.1005(4) 271 - 410	2.3	5.3
	27	Dauphin	T.R.I-81	Anthracite Expressway Linglestown to T-526	4 Lane Divided Relocation L.R.1005(5) 410 - 573	3.1	3.3
103	21	Dauphin		Interchange I-83 And L.R.22008	Interchange L.R.768(1) 88 - 100 L.R.22008(4) 80 - 113	0.5	0.8
	24	Dauphin	T.R.I-83	Susquehanna Expressway U.S.22 to I-81	4 Lane Divided Relocation L.R.766(8) 184 - 217	0.6	1.1
283	5	Cumberland	T.R.15	Camp Hill to Penna. Turnpike	Convert to Freeway L.R.123 188 - 37	3.2	2.6
285	15	Cumberland	T.R.11 T.R.15	West Shore By-Pass L.R.21015 to L.R.708	2 Lane Relocation 4 Ln Row L.R.1032	1.2	2.4
	16	Cumberland	T.R.15	West Shore By-Pass L.R.21015 to T.R.944	4 Lane Divided Relocation L.R.1038	1.9	3.3
	17	Cumberland	T.R.15	West Shore By-Pass T.R.944 to I-81	4 Lane Divided Relocation L.R.1038	2.0	3.5
	73	Perry	T.R.11 T.R.15	Marysville to Duncannon	Widen to 48' L.R.1036 0 - 481	8.2	9.3
	94	Cumberland	T.R.11 T.R.15	Wormelysburg and West Fairview Boros.	Bridge Improvement L.R.30 91 - 117	0.5	1.1
	95	Cumberland	T.R.15	Penna Turnpike to York County Line	Convert to Freeway L.R.123 0 - 18	3.6	4.8
296	79	York	T.R.30	York By-Pass T.R.30 to T.R.74	4 Lane Divided Relocation L.R.1070(1) 0 - 98	2.0	2.6
	80	York	T.R.30	York By-Pass Roosevelt Avenue To T.R.74	4 Lane Divided Relocation L.R.1070(2) 98 - 182	1.6	2.7
	83	York	T.R.250	York By-Pass I-83 to Roosevelt Ave	Reconstruct to 48' L.R.66041(7) 63 - 148	1.1	1.3
	91	Adams	T.R.194	Queen St. in Abbottstown	Reconstruct to 24' L.R.190 132 - 161	0.5	0.2
297	78	York	T.R.30	York By-Pass Mt. Zion Road to Kretz Creek Rd.	4 Lane Divided Relocation L.R.1069(1) 115 - 296	3.4	2.6
	84	York	T.R.250	York By-Pass I-83 to North Spur	Widen To 48' L.R.66041(8) 148 - 210	1.1	1.0
	88	York	T.R.250	York By-Pass North Spur to Mt. Zion Road	Reconstruct to 48' L.R.66157(2) 0 - 115	2.2	0.9
	130	Lancaster		Susquehanna Bridge Columbia to Wrightsville	Bridge Relocation 48' L.R.1069	1.1	10.4
	131	Lancaster	T.R.30	T.R.441 to Mountville	4 Lane Divided Relocation L.R.1069 60 - 235	3.3	4.1
	150	York		T.R.30 Relocation - Bridge to L.R.66018	4 Lane Divided Relocation L.R.1069	1.0	1.2
	151	York		T.R.30 Relocation Wrightsville to Hallam L.R.66018 to L.R.66019	4 Lane Divided Relocation L.R.1069	4.0	4.4
301	127	Lancaster	T.R.30	T.R.230 By Pass To Ronks (L.R.36031)	Widen to 48' L.R.215 119 - 305	3.6	2.6
318	102	Dauphin		T.R.422 Relocated Vicinity of Hummelstown Proposed Interchange at	4 Lane Divided Relocation L.R.1090	3.1	4.9
	104	Dauphin	T.R.322	Penn Harris Interchange (Urban Portion)	Interchange L.R.1090 170 - 211	0.8	3.1

LINK NO.	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
319	67	Lebanon	T.R.422	T.R.422 Relocated L.R.38028 to T.R.72 Relocated	4 Lane Divided Relocation L.R.1090	3.6	3.7
	68	Lebanon	T.R.422	T.R.422 Relocated T.R.72 Relocated to T.R.897	4 Lane Divided Relocation L.R.1090	3.6	3.7
	69	Lebanon	T.R.422	T.R.422 Relocated Dauphin Co. Line to L.R.38028	4 Lane Divided Relocation L.R.1090	5.0	5.1
	103	Dauphin		T.R.422 Relocated Vicinity of Hershey T-569 to Lebanon	4 Lane Divided Relocation L.R.1090	3.0	4.7
320	135	Lebanon	T.R.422	T.R.422 Relocated T.R.697 to T.R.501	4 Lane Divided Relocation L.R.1090	5.0	6.1
340	33	Dauphin		Harrisburg Relief Route One Half Mi. North of Maclay St. to I81	4 Lane Divided Relocation L.R.1089	1.0	1.4
	34	Dauphin		Harrisburg Relief Route I-81 to T.R.39	4 Lane Divided Relocation L.R.1089	1.7	2.5
	35	Dauphin		Harrisburg Relief Route T.R.39 to Fort Hunter	4 Lane Divided Relocation L.R.1089	1.7	2.5
	101	Dauphin	T.R.22	City of Harrisburg Intersection of Cameron and Maclay Sts.	Redesign Intersection L.R.1 58 - 92	1.1	0.9
	105	Dauphin	T.R.225	Dauphin to Peters Mountain	Reconstruct to 24' L.R.22004 0 - 143	3.7	1.4
	106	Dauphin	T.R.225	Peters Mountain	Reconstruct to 48' L.R.22004 143 - 300	3.0	7.8
	107	Dauphin	T.R.225	Peters Mountain to T.R.147	Reconstruct to 24' L.R.22004 300 - 419	2.3	1.2
347	128	Lancaster	T.R.30	Southern By-Pass Charlestown road to L.R.999	2 Lane Relocation 4 LN Row L.R.1004	0.8	0.6
	129	Lancaster	T.R.30	Southern By-Pass T.R.30 By-Pass to Charle Town Road	2 Lane Relocation 4 LN row L.R.1004	2.6	2.7
349	60	Lancaster	T.R.72	Smithville to L.R.36008	Widen to 48' L.R.36007(5) 782 - 1014	4.4	1.5
	62	Lancaster		Duke St. U.R. Lancaster	Reconstruct to 52' L.R.36036 11 - 19 L.R.36189 0 - 16	0.8	0.1
	125	Lancaster	T.R.72 T.R.222	Bridge at Engleside City of Lancaster	Bridge Improvement 45' L.R.130 1443	0.2	1.4
350	50	Lancaster	T.R.230	Salunga to Lancaster	Interchanges - Conversion L.R.129(11) 590 - 957	6.8	4.6
	57	Lancaster	T.R.230	L.R.36001 to Dauphin Co. Line.	4 Lane Divided Relocation L.R.1081(1) 0 - 130	2.5	3.5
	58	Lancaster	T.R.230	T.R.230 Relocated L.R.36068 to 36001	4 Lane Divided Relocation L.R.1081(2) 130 - 310	3.4	5.2
	59	Lancaster	T.R.230	T.R.30 Relocated T.R.230 to L.R.36058	4 Lane Divided Relocation L.R.1081(3) 310 - 590	5.3	3.9
354	71	Lebanon		L.R.137 to Midway	2 Lane Relocation L.R.35044 0 - 41	0.6	0.4
355	70	Lebanon	T.R.72	Cleona to Jonestown T.R.422 to T.R.22 T.R.72 Relocate	4 Lane Divided Relocation L.R.1114	5.7	7.2
357	52	Lancaster	T.R.222	T.R.222 Relocated T.R.230 to L.R. 36011	4 lane Divided Relocation L.R.1072(1) 0 - 160	3.1	4.6
	53	Lancaster	T.R.222	T.R.222 Relocated L.R.36011 to L.R.36143	4 lane Divided Relocation L.R.1072(3) 160 - 360	3.3	5.5

Region 6 (Cont.)

LINK IN C	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
357	54	Lancaster	T.R.222	T.R.222 Relocated L.R.35143 to L.R.137	4 Lane Divided Relocation L.R.1072(3) 360 - 540	4.0	6.4
	55	Lancaster	T.R.222	T.R.222 Relocated L.R.137 to Pa. Turnpike	4 Lane Divided Relocation L.R.1072(4) 540 - 840	6.0	7.4
356	56	Lancaster	T.R.222	T.R.222 Relocated Turnpike to Berk Co. Line	4 Lane Divided Relocation L.R.1072	3.8	7.3
[illegible]	81	York	T.R.94 T.R.194	Hanover Western By-Pass T.R.94 to T.R.194	2 Lane Relocation L.R.1118	2.6	0.7
	141	Perry	T.R.15 T.R.11	Montgomerys Ferry to Liverpool	Widen to 48' L.R.195 583 - 829	4.7	2.2
	142	York	T.R.94 T.R.194	Hanover Eastern By-Pass	2 Lane Relocation 4 LN Row	1.6	0.7

Region 7

LINK NO	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
335	1	Columbia	T.R.11	Berwick By-Pass I-80 to Luzerne County Line	2 Lane Relocation	6.3	4.8
342	44	Northumberland	T.R.147	Sunbury By-Pass to Susquehanna River Bridge at Northumberland	Reconstruct to 48' L.R.1 0- 71	2.6	3.1
343	13	Northumberland	T.R.147	Milton By-Pass Chillisquaque to I-80	2 Lane Relocation 4 LN Row L.R.1073(22) L.R.1073 502- 940	8.3	3.9
	45	Northumberland	T.R.11 T.R.147	Northumberland to S. of Chillisquaque L.R.25 SP to Near T-562	Widen to 48' L.R.18 122- 248	2.4	3.0

Region 8

LINK NO	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
[illegible]	5	Centre	T.R.322	Phillipsburg By-Pass	2 Lane Relocation L.R.1053(1) 1- 104	2.0	2.1
	7	Centre	T.R.322	Martha Furnace to Phillipsburg By-Pass	2 Lane Relocation L.R.1110	13.2	5.2
272	16	Clinton	T.R.220	Lock Haven By-Pass Mill Hall To Castanea	4 Lane Divided Relocation L.R.1063	2.4	3.9
	47	Clinton	T.R.220	City of Lock Haven Bellefonte and Main Sts. E. Park St. to Vesper St.	Redesign Intersections L.R.58 619- 633	0.3	0.2
274	7	Lycoming	T.R.220	Williamsport Beltway Rose St. to Hepburn St.	4 Lane Divided Relocation L.R.1073 230- 312	1.6	4.0
	8	Lycoming	T.R.220	Williamsport Beltway Hepburn to Mulberry Street	4 Lane Divided Relocation L.R.1073 312- 346	0.8	1.7
	34	Lycoming		Canal St. Williamsport Hepburn St. to Mulberry St.	Frontage Road	0.8	0.4
125	3	Centre	T.R.53	Bellefonte-Pleasant Gap By-Pass	4 Lane Divided Relocation L.R.1049(1) 0- 271	5.0	4.0
	37	Centre	T.R.550	Bellefonte to Bellefonte By-Pass	Reconstruct to 24' L.R.55 55- 105	0.9	0.4

Region 9

LINK NO	PROJ. NO	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
[illegible]	23	McKean	T.R.219	Bradford By-Pass L.R.97 to N.Y. State Line	4 Lane Relocation L.R.1022(2)	3.0	5.9
	26	McKean	T.R.219	Bradford By-Pass Custer City to L.R.97	4 Lane Relocation L.R.1022 L.R.97 1064-1164	4.2	5.3

Region 8

LINK NO	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
161	41	Clearfield	T.R.53	Walton St.-Chester Hill Maple St.-Philipsburg Moshannon Creek	Bridge Improvement L.R.57 219- 222	0.1	0.2
	42	Clearfield	T.R.322	Front St.-Philipsburg Point Lookout Moshannon Creek	Bridge Improvement L.R.57 222- 225	0.1	0.2
	45	Clearfield		Presquisle St.-Chester Hill and Philipsburg Moshannon Creek	Bridge Improvement L.R.17058SF 24- 26	0.1	0.0
248	77	Jefferson	T.R.119	Punxsutawney By-Pass Indiana County Line to T.R.236	4 Lane Divided Relocation	4.0	6.3
264	11	Clearfield	T.R.322	Clearfield N-S By-Pass Hyde to T.R.322 Relocated	2 Lane Relocation L.R.1106	4.0	2.8

Region 11

LINK NO	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
[illegible]	11	Blair	T.R.22	Blair Co. Line to Muleshoe Sta.	4 Lane Divided Relocation L.R.1101(1) 0- 169	3.2	8.5
	12	Blair	T.R.22	Muleshoe Sta. to T-406	4 Lane Divided Relocation L.R.1101(2) 169- 359	3.6	8.7
	13	Blair	T.R.22	T-406 to T-336 Vicinity of Duncansville	4 Lane Divided Relocation L.R.1101(3) 359- 422	1.2	2.6
	21	Cambria	T.R.22	T.R.22 to Blair Co. Line	4 Lane Divided Relocation L.R.1101(12) 1188-1246	1.1	2.4
	47	Cambria	T.R.22	Munster to Near L.R.276 Munster to Near T.R.53	4 Lane Divided Relocation L.R.1101(10) 987-1061	3.3	4.8
	48	Cambria	T.R.22	Near L.R.276 to T.R.22	4 Lane Divided Relocation L.R.1101(11) 1061-1188	2.4	3.1
251	28	Somerset	T.R.219	Relocated T.R.219 T.R.219 to T-539 Somerset By-Pass	4 Lane Divided Relocation L.R.1022(13) 1072-1156	1.6	3.1
	29	Somerset	T.R.219	Relocated T.R.219 T-539 to T-546 Somerset By-Pass	4 Lane Divided Relocation L.R.1022(14) 1156-1341	3.5	6.9
	61	Somerset		Jenner Twp.	Reconstruct to 22' L.R.55052(1) 0- 150	2.8	0.5
[illegible]	19	Cambria	T.R.56	Johnstown Road Morrellville	4 Lane Divided Relocation L.R.525(10)	1.2	[illegible]
[illegible]	4	Bedford	T.R.220	Bedford N-S By-Pass Pa. Turnpike to T.R.220 Connection	4 Lane Divided Relocation L.R.1061(3) 1312-1360	0.9	[illegible]
[illegible]	35	Bedford	T.R.220	T.R.220 Connection to Cessna. (T.R.56)	4 Lane Divided Relocation L.R.1061(4) 1360-1524	3.1	4.4
[illegible]	25	Huntingdon	T.R.522	Shade Gap to Orbisonia	Reconstruct to 24 L.R.121(9) 321- 461	3.0	[illegible]
	26	Huntingdon	T.R.522	Orbisonia to Shirleysburg	Reconstruct to 24 48 L.R.121(10) 461- 525	6.5	[illegible]
	57	Huntingdon	T.R.522	Shirleysburg to Mt. Union	Reconstruct to 48 L.R.121[illegible] 525-1097	[illegible]	[illegible]

Region 12

PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST *Millions*
57	Allegheny	T.R.48	T.R.48 Relocated Interchange with Old and New T.R.22	Interchange L.R.1076	0.5	7.1
1	Armstrong	T.R.422	Kittanning - By-Pass T.R.28 to L.R.03093	4 Lane Divided Relocation L.R.1037	3.7	20.7
31	Armstrong	T.R.28 T.R 422	Borough of Kittanning to Station 53	Reconstruct to 24' L.R.169 0- 53 L.R 251 0- 3	1.1	0.7
33	Armstrong	T.R.422	Applewold Borough	Reconstruct to Present L.R.251 26- 32	0.1	0.2
74	Indiana	T.R.422	Indiana E-W By-Pass T.R.422 West to L.R.1113	4 Lane Divided Relocation L.R.1112	4.2	8.0
45	Butler	T.R.422 T.R.68	Intersection Butler Twp.	Hazard Elimination L.R.78 932- 935 L.R.79(OLD) 858- 863	0.2	0.1
59	Butler	T.R.356	City of Butler	Reconstruct to Existing L.R.10030 495- 491	0.1	0.1
37	Westmoreland	T.R.56	Allegheny Twp-Vander Grift Boro	Reconstruct to 48' L.R.168(9) 551- 750	3.8	4.8
23	Washington	T.R.22	W. Va. Line to Florence	Reconstruct to 48' L.R.257(6) 0- 251	4.8	4.7
24	Washington	T.R.22	Florence-Pavington	Reconstruct to 48' L.R.257(5) 251- 507	4.8	6.1
20	Indiana	T.R.119 T.R.422	Indiana E-W By-Pass	Interchange L.R.1112(1) 662- 767 L.R.1113(1) 693- 724	3.8	3.6
31	Allegheny	T.R.993	Braddock Ave. Viaduct	4 Lane Divided Relocation L.R.1074	1.2	6.1
30	Westmoreland	T.R.30	Allegheny Co. Line F to Circleville L.R.64090 West of Irwin	4 Lane Divided Relocation	3.5	10.4
59	Westmoreland	T.R.30	Allegheny Co. Line to Greensburg L.R.64090 to Pa. TP	4 Lane Divided Relocation L.R.1102	3.2	11.4
35	Westmoreland	T.R.30	Ligonier By-Pass	Widen to 48' L.R.119 FAR 86- 176	1.7	0.8
7	Fayette		Uniontown By-Pass T.R.21 to T.R.119 South	4 Lane Divided Relocation L.R.1058(3) 300- 407	2.4	4.2
5	Fayette	T.R.119	Uniontown By-Pass T.R.51 to T.R.119 North	4 Lane Divided Relocation L.R.1058(1) 0- 190	4.0	4.4
32	Westmoreland		Mt. Pleasant to New Stanton Mt. Pleasant to L.R.	4 Lane Divided Relocation	3.0	2.9
33	Westmoreland		Mt. Pleasant to New Stanton L.R.64228 to New Stanton	4 Lane Divided Relocation	2.5	4.4
3	Armstrong	T.R.66 AL	North Vandergrift to L.R.03038 SP.E Parks Twp.	Widen to 36' L.R.705(3) 0- 128	2.4	0.3
32	Armstrong	T.R.66	L.R.03155 to T.R.422 Relocated Ford City	Widen to 48' L.R.203 646- 810	3.2	1.5
45	Fayette	T.R.119	Smithfield to L.R.26010	4 Lane Divided Relocation	2.4	4.4
46	Fayette	T.R.119	L.R.26010 to Uniontown By-Pass	4 Lane Divided Relocation	3.1	6.0
3	Allegheny	T.R.51	Sawmill Run Blvd Liberty Tube to Route 88	6 Lane Divided Relocation L.R.247	2.5	22.5
49	Allegheny	T.R.19 T.R.51	Saw Mill Run Blvd L.R.606 to L.R.766 City of Pittsburgh	Reconstruct to 72' L.R.247 576-657	1.5	14.2

PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST *Millions*
1	Allegheny		River Road T.R.28 to T.R.65	4 Lane Divided Relocation	2.0	6.0
18	Allegheny	T.R.I-79	Pittsburgh - Erie Expw Ft. Dusquesne Bridge to Cremo St.	4 Lane Divided Relocation L.R.1021(10) 1071-1078	0.1	16.3
19	Allegheny	T.R.I-79	Pittsburgh - Erie Expw Anderson St. to Murat St.	6 Lane Divided Relocation L.R.1021(2) L.R.1040(1) 1087-1134	0.8	26.0
30	Allegheny	T.R.65	Ohio River Blvd. Ext. Sheffield St. to California Ave.	6 Lane Divided Relocation L.R.1039 944-100	1.2	21.9
38	Westmoreland		Allegheny Co. Line to L.R.64015 Washington Twp.	4 Lane Divided Relocation L.R.348(9) 0- 126 L.R.229 0- 32	3.2	2.2
39	Westmoreland	T.R.380	L.R.64015 to North Washington	4 Lane Divided Relocation L.R.348(8) 126- 367	4.6	2.5
24	Allegheny		Allegheny Valley Expressway Hulton Bridge to Pa. Tpk.	4 Lane Divided Relocation L.R.1037(2) 603-735	2.6	2.5
25	Allegheny		Allegheny Valley Expressway Hulton Bridge to Pa. Tpk.	Bridge Structures L.R.1037(2A) 603-735	2.6	0.9
12	Butler	T.R.28	Allegheny Valley Express South of Allegheny Co. Line to Little Buffalo	4 Lane Divided Relocation L.R.1037(7) 0- 110	2.1	3.
26	Allegheny	T.R.28	Allegheny Valley Expressway Penna. Turnpike to L.R.02169	4 Lane Divided Relocation L.R.1037(3) 735-840	2.0	2.7
27	Allegheny		Allegheny Valley Expressway L.R.02169 to Creighton	4 Lane Divided Relocation L.R.1037(4) 838-984	2.9	3.4
28	Allegheny	T.R.28	Allegheny Valley Expressway Creighton to L.R.02220	4 Lane Divided Relocation L.R.1037(5) 840-968	3.5	4.5
29	Allegheny		Allegheny Valley Expressway L.R.02220 to Butler County	4 Lane Divided Relocation L.R.1037(6) 1155-1325 L.R.1037(8) 0- 20	3.6	4.6
4	Armstrong	T.R.28	Allegheny Valley Expwy. Butler Co. Line to T-404	4 Lane Divided Relocation L.R.1037(9) 8- 263	4.6	5.3
5	Armstrong	T.R.28	Allegheny Valley Expwy. L.R.03010 to T.R.422	4 Lane Divided Relocation L.R.1037(11) 435- 590	2.9	3.3
13	Butler	T.R.28	Allegheny Valley Express Little Buffalo Creek to Armstrong County Line	4 Lane Divided Relocation L.R.1037(8) 0- 8 L.R.1037(9) 110- 151	0.9	1.6
2	Fayette	T.R.40	Mt. Summit to Chalk Hill S.E. of Uniontown	Reconstruct to 48' L.R.50(7) 288- 390	1.9	0.7
8	Fayette	T.R.40	Uniontown By-Pass T.R.40 East to T.R.119 South	4 Lane Divided Relocation L.R.1058(4) 407- 566	3.3	4.7
3	Fayette	T.R.40	Brownsville to Davidson	4 Lane Divided Relocation L.R.113(20F)	2.4	3.3
9	Fayette	T.R.40	Davidson to Rocks Works	4 Lane Divided Relocation L.R.1117(1)	4.6	4.6
44	Fayette	T.R.40	Rocks Works to Uniontown By-Pass	4 Lane Divided Relocation	3.1	4.2
53	Washington	T.R.88	Mon-Valley Expressway California - Elco By-Pass to Fayette Co. Line	4 Lane Divided Relocation	3.2	6.1
21	Washington	T.R.18	Burgettstown By-Pass Smith Twp.	2 Lane Relocation	1.0	1.5
39	Beaver	T.R.65	Freedom By-Pass	4 Lane Divided Relocation L.R.641	2.0	4.6
20	Allegheny		Beaver Valley Expressway Airport to L.R.02003	4 Lane Divided Relocation L.R.1023(1) 1185-1300	2.1	3.2

LINK NO.	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
222	21	Allegheny		Beaver Valley Expressway L.R.02003 to Co. Line	4 Lane Divided Relocation L.R.1023(1A) 1300-1480	3.4	6.6
	40	Beaver		Beaver Valley Expressway T.R.51 to Vanport Bridge	4 Lane Divided Relocation L.R.1023(4) 366-499	2.5	6.9
224	51	Washington	T.R.88	Mon-Valley Expressway T.R.481 to I-70	4 Lane Divided Relocation	4.3	9.7
226	44	Allegheny	T.R.68	Mon Valley Expy. T.R.51 Interchange to Library Rd. Interchange	Multi Lane Relocation	3.9	27.7
227	32	Allegheny	T.R.48	T.R.48 Relocated Versailles to White Oak	4 Lane Divided Relocation L.R.1076(3) 364-450	1.6	10.7
	33	Allegheny	T.R.48	T.R.46 Relocated White Oak to T.R.30	4 Lane Divided Relocation L.R.1076(4) 450-610	3.0	3.6
	34	Allegheny	T.R.48	T.R.45 Relocated T.R.30 to T.R.993	4 Lane Divided Relocation L.R.1076(5) 610-735	2.4	3.6
233	40	Butler	T.R.8	Intersections City of Butler	Hazard Elimination L.R.72 733- 738 L.R.10047 712- 717	0.3	0.1
234	42	Butler	T.R.8	City of Butler	Reconstruct to Present L.R.73 0- 43	0.8	0.4
246	19	Indiana	T.R.119	T.R.22 to Homer City	Widen to 48' L.R.68(15) 132- 567	7.5	1.8
246	23	Indiana	T.R.119	Indiana N-S By-Pass	4 Lane Divided Relocation L.R.1113(2) 65- 255	3.8	3.6
	24	Indiana	T.R.119	Indiana N-S By-Pass	4 Lane Divided Relocation L.R.1113(3) 255- 404	2.8	2.6
	73	Indiana	T.R.119	Bridges Over Mahoning Creek - Mahoning Twp.	Bridge Improvement L.R.63 647- 902	1.0	0.6
249	12	Allegheny	T.R.I-79	Pittsburgh- Erie Expw Sp. Garden Ave. to Pittsburgh City Line	6 Lane Divided Relocation L.R.1021(3) 24-168	2.7	20.3
	13	Allegheny	T.R.I-79	Pittsburgh - Erie Expw T.R.19 to L.R.02089	4 Lane Divided Relocation L.R.1021(5) 225-315	1.7	8.8
	14	Allegheny	T.R.I-79	Pittsburgh - Erie Expw L.R.02089 to I-279	4 Lane Divided Relocation L.R.1021(6) 315-575	4.9	12.1
	15	Allegheny	T.R.I-79	Pittsburgh - Erie Expw I-279 to Bayne-Wexford Road	6 Lane Divided Relocation L.R.1021(7) 575-730	2.9	6.6
	16	Allegneny	T.R.1-79	Pittsburgh - Erie Expw Bayne-Wexford Road to Warrendale	6 Lane Divided Relocation L.R.1021(8) 730-862	2.5	5.6
	17	Allegheny	T.R.I-79	Pittsburgh - Erie Expw Warrendale to Butler Co. Line	6 Lane Divided Relocation L.R.1021(9A) 862-926	1.1	4.7

Region 13

LINK No.	PROJ. NO.	COUNTY	TRAFFIC ROUTE	NAME LOCATION	TYPE OF IMPROVEMENT L. R. STATIONS	MILES	COST Millions
123	42	Warren	T.R.6	Warren By-Pass	4 Lane Divided Relocation	5.8	4.7
	43	Warren		Jackson Crossing to Warren By-Pass	Widen to 48' L.R.88(14) 1305-1416	2.1	0.3
[illegible]	20	Lawrence	T.R.65	L.R.37036 to New Castle City Line	Widen to 40' L.R.315 572-610	0.7	0.7
	24	Lawrence	T.R.422	New Castle By-Pass T.R.168 to T.R.422 East	4 Lane Divided Relocation L.R.1055 107-320	3.9	7.2
	25	Lawrence	T.R.422	New Castle By-Pass Harborbridge to T.R.168 and [illegible] to T.R.108	4 Lane Divided Relocation L.R.1055 0-107 L.R.1055 520-672	4.9	7.3
	71	Lawrence	T.R.65	Ellwood City to Energy	4 Lane Divided Relocation	4.0	4.3
	73	Lawrence	T.R.65 T.R.422	City of New Castle NW to L.R.81	Widen to 48' L.R.61 Spur 0-16 L.R.37061 0-160	3.3	1.2
	74	Lawrence	T.R.422	Grant Ave. City of New Castle T.R.18 to T.R.224	Reconstruct to 48' L.R.81 641-674	0.6	0.9
	75	Lawrence	T.R.65	Energy to New Castle By-Pass	Widen to 48' L.R.315 350-560	4.0	2.3
[illegible]	29	Mercer	T.R.258 T.R.18	I-80 to T.R.518	Widen to 48' L.R.238(15) 381-423 L.R.320(6) 0-208	4.7	0.8
	31	Mercer	T.R.18	T.R.518 to L.R.43036	Reconstruct to 48' L.R.238(18) 862-1124	5.0	0.8
	32	Mercer	T.R.18	L.R 43036 to Greenville	Widen to 48' L.R.238(20) 1124-1418	5.5	1.8
	78	Mercer		Greenville By-Pass T.R.18 So. to T.R.18 No. West of Greenville	2 Lane Relocation 4 LN R/W	3.6	3.4
	80	Mercer		L.R.43007 to T.R.62	Widen to 20' L.R.43005 307-512	3.9	0.6

Table C-1b

CAPACITY DEFICIENT LINKS NOT INCOUDED IN THE SECOND SIX-YEAR HIGHWAY IMPROVEMENT PROGRAM

gion	Link Number*	Route	County	Length of Link (miles)
1	44	Turnpike	Chester	14
1	94	I.S. 76	Philadelphia	1
1	95	"	"	3
1	96	"	Montgomery	11
1	97	"	"	4
1	310	U.S. 1	Delaware	5
1	311	"	Del, Montg, Phila	9
1	312	"	Montg, Phila	2
1	313	"	Philadelphia	2
1	214	"	Bucks, Phila	14
1	315	"	Bucks	2
1	316	"	"	2
1	325	U.S. 422	Montgomery	3
1	326	"	"	3
1	362	Pa. 41	Chester	8
1	363	"	Chester, Lancaster	8
1	364	Pa. 10	Chester	7
1	365	"	Chester, Lancaster	14
1	367	U.S. 202, 322	Delaware	4
1	368	"	Del, Chester	7
1	371	Pa. 100	Chester	14

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*Refers to link numbers used in Intercity Transportation Demand in Pennsylvania to 1975, Appendix Volume, FIRL, March 1968.

(continued from previous page)

1	374	Pa. 3	Chester, Del.	13
1	400	U.S. 611	Philadelphia	2
1	402	"	Bucks, Montg	10
1	430	U.S. 1	Philadelphia	1
1	431	Baltimore Pike	Delaware	3
1	422	Pa. 320	"	2
1	444	"	"	4

Total link mileage for Region 1 175

Region	"	"	"	"
2	104	I.S. 378	Lehigh	3
3	407	U.S. 209	Monroe	3
3	134	U.S. 106	Wayne	11
3	21	I.S. 80	Monroe	1
Total Link Mileage for Region 3				15
4	132	U.S. 6	Wyoming	10
5	132	U.S. 6	Lackawanna	10
6	281	U.S. 15	Adams	14
6	329	U.S. 209	Dauphin	20
6	353	Pa. 72	Lancaster	12
6	427	Pa. 94	Adams	12
6	437	U.S 11	Cumberland	9
Total link mileage for Region 6				67
7	289	Pa. 45	Union	6
10	241	"	Clarion	6
11	31	Turnpike	Somerset	13
11	260	U.S. 219	Cambria	10
11	267	U.S. 220	Bedford, Blair	27
Total link mileage for Region 11				50

12	146	U.S. 422	Butler	2
12	147	"	"	14
12	148	"	Armstrong	9
12	241	Pa. 68	Armstrong, Butler	20
12	27	Turnpike	Allegheny	8
12	28	"	"	9
12	59	U.S. 22, 30 I.S. 79	"	6
12	60	U.S. 22, 30 I.S. 76	"	
12	61	I.S. 76	"	8
12	62	I.S. 76	"	
12	164	Pa. 68	Beaver	12
12	166	Pa. 68	Beaver	5
12	199	Pa. 51	Allegheny	6
12	203	Pa. 8	"	9
12	204	Pa. 28	"	10
12	213	Pa. 18	Beaver	15
12	215	Pa. 51	"	5
12	220	Pa. 18	"	4
12	225	local Pittsburgh roads	Allegheny	
12	228		"	
12	229		"	
12	29	Turnpike	Westmoreland	9
12	30	Turnpike	Westmoreland	8
12	31	"	"	21
12	197	Pa. 51	Fayette	20

continued from previous page)

12	211	U.S. 40	Washington	4
12	213	Pa. 18	Washington	4
Total link mileage for Region 12				208
13	156	U.S. 22	Mifflin	23
Total link mileage for State				587

FIRL would constitute a good highway program. Other factors such as permissible speed, or time in transit, are also important factors to consider. An attempt was made to quantify the directness and quality of intercity highways in Pennsylvania for major city pairs of the State as shown in Table C-2. The table shows estimates of existing driving time requirements (as determined by the Keystone AAA Club for non-rush hour conditions) and highway distances between the *downtown centers* of the Commonwealth's sixteen largest cities. These driving times and mileage were compared with standards to get some measure of directness. The standard, shown as "ideal" connections in Table C-2 assumed a hypothetical straight line expressway, central city to central city, on which the average driving speed would always be 60 mph. Then, the effect of major new interstate highway construction was measured against the ideal standard and existing conditions by assuming that the certain interstate highways, scheduled for completion while early 1970's, have already been completed. The interstate highways considered in the hypothesis were Interstate 79 and Interstate 80. One interesting indication which resulted from this analysis is the apparent lack of benefit provided to northwestern Pennsylvania cities by completion of I-79 and I-80 in connecting them with Southeastern Pennsylvania cities. For example, the driving time between Erie and Philadelphia is now about 9 hours and 15 minutes. With completion of I-80 and I-79, the driving time will be reduced by only 15 minutes to about 9 hours while the driving distance will be increased by about 41 miles to a total driving distance of 430 miles with a hypothesized ideal driving distance of 292 miles and driving time of 4 hours and 52 minutes. Clearly, much could be done to reduce driving time diagonally across the state between Erie and Philadelphia. However, this is not a mandate to construct such a diagonal highway. Other factors such as the preponderance of ridgelines running perpendicular to this diagonal could make construction costs prohibitive. Also, perhaps demand for trips across an Erie-Philadelphia diagonal would be light once the interstate network is completed. The analysis merely points out possible study areas for improving intercity highway connections.

Of course, highways are built for many reasons, of which capacity need and reduced intercity driving times are but two. This suggests that a greater understanding of existing needs and on-going construction would be helpful to development of an Interim Master Plan.

Table C-2
Comparison of Driving Conditions Between Major Pennsylvania Cities

Mi = road miles; DT = driving time in hours and minutes

Condition	Allentown		Altoona		Erie		Harrisburg		Johnstown		Lancaster		Lebanon		New Castle		Philadelphia		Pittsburgh		Reading		Scranton		Sharon		Wilkes-Barre		Williams-port		York	
	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT
Allentown																																
Present	-	-	226	4-15	370	8-00	82	1-30	227	4-30	68	1-45	54	1-0	334	7-00	58	1-10	278	5-30	36	0-45	87	1-40	372	7-45	63	1-15	114	3-15	103	2-00
180 Completion†	-	-	216	4-30	325	7-00	-	-	258	5-15	-	-	-	-	347	7-00	-	-	-	-	-	-	-	-	337	7-00	-	-	132	2-30	-	-
180 & 179	-	-	-	-	354	6-55	-	-	-	-	-	-	-	-	-	-	-	-	310	6-45	-	-	-	-	-	-	-	-	-	-	-	-
Ideal	-	-	161	241	260	4-20	76	1-16	179	2-59	58	58	52	1-02	250	4-10	47	47	233	3-53	30	30	55	55	240	4-00	50	50	91	1-31	80	1-20
% Act. vs Ideal	-	-	140	158	142	185	108	118	140	158	117	181	104	115	134	168	123	149	119	142	120	150	158	182	155	194	126	150	125	214	129	150
Altoona																																
Present	-	-	-	-	195	4-15	127	2-55	41	1-00	165	3-45	161	4-00	131	4-00	236	3-55	99	2-10	189	4-45	175	4-30	161	4-00	162	4-00	94	2-15	153	3-15
180 Completion†	-	-	-	-	180	4-05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	180	4-00	177	3-30	173	3-30	125	3-30	-	-
180 & 179	-	-	-	-	209	4-00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ideal	-	-	-	-	140	2-20	82	1-22	30	0-30	112	1-52	103	1-43	104	1-44	171	2-51	84	1-24	128	2-08	157	2-37	118	1-58	140	2-20	86	1-26	94	1-34
% Act. vs Ideal	-	-	-	-	139	182	155	213	137	200	147	201	156	233	126	231	138	137	118	155	148	223	111	172	136	204	116	171	109	157	163	207
Erie																																
Present	-	-	-	-	-	-	275	6-00	165	4-15	312	7-10	300	7-00	90	2-15	389	9-25	135	3-25	335	7-15	270	8-00	77	1-45	285	8-30	195	5-45	300	6-30
180 Completion†	-	-	-	-	-	-	280	6-20	-	-	315	7-20	305	7-00	-	-	401	9-05	-	-	295	7-30	300	7-00	-	-	285	6-45	205	5-00	305	6-35
180 & 179	-	-	-	-	-	-	309	6-15*	157	3-30	344	6-55	334	6-55	82	1-30	430	9-00	127	2-15	324	7-25	329	6-55	88	1-35	314	6-40	234	4-55	334	6-30*
Ideal	-	-	-	-	-	-	216	3-36	135	2-15	239	3-59	222	3-42	80	1-20	292	4-52	114	1-44	243	4-03	229	3-49	63	1-03	221	3-41	170	2-50	224	3-44
% Act. vs Ideal	-	-	-	-	-	-	127	167	122	189	130	180	135	189	112	169	133	190	118	180	138	302	118	210	122	167	129	231	115	203	134	174
Harrisburg																																
Present	-	-	-	-	-	-	-	-	138	2-55	37	0-50	29	0-40	247	5-20	107	2-00	190	4-00	56	1-15	133	3-20	259	5-50	111	2-50	88	2-05	25	0-35
180 Completion†	-	-	-	-	-	-	-	-	-	-	-	-	-	-	252	4-45	-	-	-	-	-	-	-	-	256	4-45	-	-	-	-	-	-
180 & 179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ideal	-	-	-	-	-	-	-	-	118	1-58	32	0-32	23	0-23	186	3-06	92	1-32	162	2-42	49	0-49	98	1-38	196	3-16	82	1-22	65	1-05	22	0-22
% Act. vs Ideal	-	-	-	-	-	-	-	-	117	1-48	116	156	126	174	133	172	116	130	117	148	114	153	141	204	132	178	135	207	135	192	114	159
Johnstown																																
Present	-	-	-	-	-	-	-	-	-	-	205	4-35	200	4-25	106	210	239	4-00	69	1-35	230	5-30	215	5-20	132	3-30	190	4-10	140	3-00	155	3-15
180 Completion†	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	220	4-45	-	-	200	3-15	135	2-50	-	-
180 & 179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ideal	-	-	-	-	-	-	-	-	-	-	136	2-16	129	2-09	86	1-26	192	3-12	56	0-56	156	2-36	186	3-02	100	1-40	172	2-52	116	1-56	117	1-57
% Act. vs Ideal	-	-	-	-	-	-	-	-	-	-	151	202	155	205	123	151	124	125	123	170	147	212	118	176	132	210	110	145	121	135	132	218
Lancaster																																
Present	-	-	-	-	-	-	-	-	-	-	-	-	23	0-35	290	6-00	64	1-30	236	4-45	33	1-00	155	2-45	309	6-30	130	2-15	125	2-50	24	0-35
180 Completion†	-	-	-	-	-	-	-	-	-	-	-	-	-	-	275	7-15	-	-	-	-	-	-	-	-	270	7-00	-	-	-	-	-	-
180 & 179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ideal	-	-	-	-	-	-	-	-	-	-	-	-	21	0-21	217	3-37	60	1-00	193	3-13	29	0-29	98	1-38	230	3-50	84	1-24	89	1-29	24	0-24
% Act. vs Ideal	-	-	-	-	-	-	-	-	-	-	-	-	110	167	134	166	107	150	122	148	114	207	158	291	134	170	155	161	140	191	100	146
Lebanon																																
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	274	6-00	88	1-45	235	4-45	27	0-45	122	2-15	299	6-15	121	2-45	121	2-30	54	1-15
180 Completion†	-	-	-	-	-	-	-	-	-	-	-	-	-	-	233	6-30	-	-	-	-	-	-	-	-	266	6-00	-	-	-	-	-	-
180 & 179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	270	4-30	71	1-11	184	3-04	26	0-26	82	1-22	233	3-53	67	1-07	66	1-06	30	0-30
% Act. vs Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	101	133	124	148	128	155	104	173	149	311	128	161	180	246	183	227	180	250
New Castle																																
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	348	6-40	52	1-20	300	6-00	390	7-10	23	0-30	305	7-15	228	530	265	5-15
180 Completion†	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	376	7-20	-	-	282	6-15	275	5-50	-	-	255	5-15	190	4-15	-	-
180 & 179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	56	1-05	-	-	-	-	-	-	-	-	-	-	-	-
Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	276	4-36	44	0-44	230	3-50	240	4-00	18	0-18	223	3-43	171	2-51	198	3-18
% Act. vs Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	126	145	118	182	130	156	163	179	128	167	139	190	133	193	134	159

*Many may continue to use existing route after completion of Interstate 80 & 79

†Adapted from information provided by Keystone AAA.

Comparison of Driving Conditions (Continued)

Mi - road miles; DT - driving time in hours and minutes

Condition	Allentown		Altoona		Erie		Harrisburg		Johnstown		Lancaster		Lebanon		New Castle		Philadelphia		Pittsburgh		Reading		Scranton		Sharon		Wilkes-Barre		Williams-port		York	
	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT	Mi	DT
Philadelphia																																
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	305	5-25	63	1-30	126	3-00	381	7-25	114	2-30	184	3-50	92	2-10
180 Completion†	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	374	7-20	-	-	-	-	-	-
180 & 179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	252	4-12	48	0-48	101	1-41	289	4-49	94	1-34	130	2-10	82	1-22
% Act. vs Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	121	129	131	187	125	178	132	154	121	160	142	177	112	158
Pittsburgh																																
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	226	5-15	276	6-30	84	1-30	254	6-00	196	4-15	222	4-15
180 Completion†	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	311	6-45	-	-	285	6-15	221	5-00	-	-
180 & 179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	314	6-35	82	1-30	284	6-00	221	5-15	-	-
Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	210	3-30	234	3-54	60	1-00	218	3-38	160	2-40	172	2-52
% Act. vs Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	123	150	118	167	140	150	116	165	122	159	129	148
Reading																																
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	127	2-30	323	6-30	87	1-30	114	1-45	50	175
180 Completion†	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	274	6-15	-	-	113	1-30	-	-
180 & 179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	74	1-14	242	4-02	63	1-03	81	1-22	48	0-48
% Act. vs Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	172	203	133	161	138	143	141	130	104	156
Scranton																																
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	295	7-45	17	0-25	78	1-50	193	3-30
180 Completion†	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	275	5-30	-	-	90	1-40	-	-
180 & 179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	247	4-07	15	0-15	70	1-10	111	1-51
% Act. vs Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	119	188	113	167	111	189	174	189
Sharon																																
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	280	7-30	233	6-00	291	600
180 Completion†	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	265	5-45	205	4-30	246	5-15
180 & 179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	236	3-56	176	2-56	212	3-32
% Act. vs Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	119	191	132	204	137	170
Wilkes-Barre																																
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	68	1-30	158	3-00
180 Completion†	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	102	2-00	154	3-30
180 & 179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	60	1-00	99	1-39
% Act. vs Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	113	150	160	182
Williamsport																																
Present	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	109	2-30
180 Completion†	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
180 & 179	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	85	1-25
% Act. vs Ideal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	128	176

*Many may continue to use existing route after completion of Interstate 80 & 79

†Adapted from information provided by Keystone AAA.

Existing Highway Needs and Developments

The Pennsylvania Department of Highways splits its planning activities into two categories, *i.e.*, short-range planning and long-range planning. The short-range planning is carried out by a nine-man highway commission. The commission focus is on the highway needs of the state from the present to about 10 or 15 years in the future. It is the commission which, with the input of local planning groups and concerned citizens, constructs the Six-Year Highway Improvement Programs. Long-range highway planning, *i.e.*, 10 to more than 30 years hence, is conducted by the Bureau of Advance Planning of the Highway Department. The Bureau has a small staff which coordinates its activities primarily with four organizations: The Highway Commission, The State Planning Board, The Delaware Valley Regional Planning Commission (at Philadelphia) and the Southwestern Pennsylvania Regional Planning Commission (at Pittsburgh).

Both the Bureau and the Highway Commission divide the State into 12 districts for the purpose of planning. This creates some confusion because the State Planning Board uses 13 regions in its planning activities. Fortunately, most of the 12 highway districts include very nearly the same counties included in the 13 regions of the Planning Board. We chose to analyze highway needs and developments using the 13 Planning Board regions because they afforded a more detailed breakdown and because much of the demographic and descriptive information which we obtained came from the State Planning Board. A description of on-going highway construction and related activities is given by region in Appendix C-1.

THE PENNSYLVANIA STATE PLANNING BOARD

The State Planning Board consists of 24 members, of whom 15 are appointed by the Governor from among the citizens of Pennsylvania. Of the remaining 9 members, 4 hold offices in the State legislature and 5 hold positions with the State government as Secretaries of Commerce, Highways, Forests and Waters, Agriculture, and Community Affairs. The Board serves as an agency for advancing the social, physical, and economic development of the Commonwealth. Many of the Planning Board's programs require support in the form of transportation improvements. Conversely, the Planning Board can assist a PennDOT by responding to its needs for real estate zoning and planning. The Board's planning activities are financed primarily by appropriations from the State's General Fund and from funds provided by various federal sources.

The State Planning Board is the logical choice to serve as, at least, a portion of an advisory panel for a PennDOT since so much of its activities are transportation related. The Board functions as the thread which holds all of the various departments together. For example, the Board is now charged with the responsibility for drawing up the Capital Program of the Commonwealth. In the 1967-1973 Capital Program the following recommended budget appeared:

Region*	Designation of Region	Preservation of Natural and Historic Resources ($)	Recreation ($)
1	Southeastern	3,299,500	14,672,313
2	Great Valley	265,312	3,300,739
3	Poconos		3,755,900
4	Northern Tier	217,000	1,314,900
5	Anthracite		4,974,284
6	Piedmont	18,228,424	2,214,500
7	Middle Tier		2,061,948
8	Upper Susqhehanna	108,750	3,553,095
9	North Woods	216,075	1,069,200
10	Shortway Plateau		3,618,176
11	Southern Allegheníes		7,957,498
12	Southwestern	907,750	12,382,948
13	Northwest	114,000	5,594,525
		$23,306,811	$66,470,027

*See Figure 2-1 for outline of region.

The above budget reflects the recommendations of the State Planning Board made in a specially prepared Statewide Outdoor Recreation Plan. The Plan serves as a continuing guideline for land acquisitions by several state agencies. Financing of The Plan is to come from bonds issued under $500 million Pennsylvania Land and Water Conservation and Reclamation Fund Act which received favorable public support in the Referendum of 1967.

In recent years 'monies' for land purchases in Pennsylvania recommended by the Board have come primarily from two sources: The Federal Land and Water Conservation Fund, and PROJECT 70 Funds. The Federal Fund was authorized by the Federal Land and Water Conservation Fund Act. This is a major program through which the state, county, and municipal governments have supplemented development of recreation and conservation areas. By mid 1967, 29 project improvements had been made in Pennsylvania under federal act at a total cost of over $12 million.

The other principal fund which finances the outdoor recreation projects recommended by the Board, the PROJECT 70 Fund, was authorized by the PROJECT 70 Land Acquisition and Borrowing Act in a 1963 referendum. The PROJECT 70 program derived its name from the plan to spend seventy-million dollars by 1970 for the acquisition of land and water sites, for recreation, conservation, and historical purposes.

PROJECT 70 has three main objectives as conceived by the State Planning Board:

1. Develop system of regional parks.
2. Aid urban centers by providing funds to acquire outdoor and recreation areas which could serve to relieve the *monotony* of urban congestion.

3. Provide fish and wild life preserves; provide access to rivers, lakes, and streams.

Each region of the state has benfited from the program. In 1967, the State Planning Board listed more than 151,000 areas of land which had been purchased with PROJECT 70 assistance to add to the open space lands at a total cost of just over $67 million. At the time of reporting, the PROJECT 70 assistance portion of the $67 million amounted to about $44 million.

The state agencies which follow the State Planning Board guidelines in the purchase of outdoor recreation land and the extent of their purchases using PROJECT 70 and federal funds are shown below:

SUMMARY OF OPEN SPACE PROJECTS[1]

By Agency

	PROJECT 70				LAND AND WATER CONSERVATION FUND	
Agency	No. of Projects	Acreage	Acquisition Cost ($ 000's)[2]	PROJECT 70 Assistance ($ 000's)[3]	No of Projects	Development Cost ($ 000's)
Dept of Forests and Waters	31	63,880	19,250	18,850	4	3,800
Fish Commission	35	6,403	3,600	3,600	4	500
Game Commission	14	22,494	3,800	3,800	2	2,400
Dept of Community Affairs	373	58,227	40,400	17,800	19	5,700
TOTAL	453	151,004	67,050	44,050	29	12,367

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[1] As of mid 1967

[2] Certain projects will be partially financed by Federal grants under Title VII, Housing Act of 1965.

[3] Estimated total PROJECT 70 assistance is based on amount of funds spent to date and projected assistance required to complete acquisitions.

The State Planning Board, at the present, does not have a comprehensive plan for state development but is building toward one. The Board's publication, *Pennsylvania Regions, A Survey of The Commonwealth,* which was published in 1967, provides a foundation from which a comprehensive plan should emerge Ideally, the overall plan for state development will mesh with an eventual Master Plan for Transportation. (Many important points cited by the Planning Board for the 13 regions of the State will be found in Appendix E.) Some transportation-related ideas (*op. cit.*) for improvements in the state have been expressed or implied by the Planning Board as follows:

Region 1* (Southeastern) - Take advantage of the regions central location in Megalopolis to increase white collar employment and R & D oriented industry as fallout from Washington and New York.

Region 2 (Great Valley) - Catch the overflow from Megalopolis and build on primarily to financiers in New York and Philadelphia.

Region 3 (Poconos) - Provide for maximumizing the regions potential to become the recreation center of Megalopolis; provide outstanding access to Tocks Island Reservoir by the time it is completed in the late 1970's.

Region 4 (Northern Tier) - Provide better opportunities in the form of improved roads, for those who wish to enjoy the rural setting as a residence, but maintain good jobs in neighboring Binghamton, New York, or Wilkes Barre, Pennsylvania.

Region 5 (Anthracite) - Take advantage of Interstate Highway completions to draw the region into participation in the booming economy of the eastern seaboard. Improve the environment by cleaning up the region's cities and satisfactorily disposing of sewage.

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*See Figure 2-1 for outline of regions.

Region 6 (Piedmont) - Exploit the developing advantage of Harrisburg as the sub-city of Pennsylvania, convenient to the major centers of culture and shopping, *i.e.*, New York, Philadelphia, and Baltimore.

Region 7 (Middle Tier) - Help divert the region from reliance on a declining anthracite industry to recreation and tourism by purchasing 4,000 acres of land, stopping water pollution, and building access roads.

Region 8 (Upper Susquehanna) - Facilitate the conversion from reliance agriculture to manufacturing and service by aiding the development of Williamsport and State College.

Region 9 (North Woods) - Encourage continued increases in high-paying employment by making the region more accessible to market for the kind of sophisticated electronics products already manufactured there.

Region 10 (Shortway Plateau) - Control extractive industries to the extent that they do not noticeably alter the scenery of the region, but that they do continue to provide substantial employment.

Region 11 (Southern Alleghenies) - Improve highways, particularly in the vicinity of Altoona, to restore the region's transportation position which declined after the Pennsylvania Turnpike was built.

Region 12 (Southwestern) - Develop new specialties in competition with other sections in the nation. Find some way to take advantage of the fact that Pittsburgh is by far the largest city in Appalachia.

Region 13 (Northwest) - Make the communities of Erie, Meadville, Sharon, and New Castle more attractive to prospective residents; draw the smaller communities into the Pittsburgh circle by constructing a "Beaver Valley Expressway."

PLANS OF THE BUREAU OF COMMUNITY DEVELOPMENT

The Bureau of Community Development is one of two Bureaus of the Department of Community Affairs. The Department of Community Affairs was formed under Act No. 582 on February 1, 1966. It has as its function the processing of information concerning local government problems and coordinating state and federal grant programs for improvement of Pennsylvania communities. It also sponsors research and consulting services for local governments. Its community development functions include recreation, housing, and transportation. When the Department was formed, it inherited several programs and projects which had been initiated primarily by the State Department of Commerce. Clearly, the Bureau of Community Affairs was formed to be Pennsylvania's counterpart of the Department of Housing and Urban Development (HUD) at the federal level. Since federal DOT and HUD have not yet clarified their roles in relationship to each other, it would appear that some similar confusion might develop between their counterparts at State level; for example, where would PennDOT's transportation authority end and the Department of Community Affairs authority begin if no definite geographic or functional boundaries exist? Most recently, there has been a move in Washington to transfer all transportation development authority from HUD to DOT. There is still some question as to whether or not the shift will work satisfactorily, because of the great coordination demanded between urban transportation improvements and projects for upgrading of other living conditions in the cities.

Some conflict has already arisen in Pennsylvania as a result of funding a local organization, SEPTA, to finance improvement of rail facilities outside of its assigned boundaries of authority, *i.e.*, Harrisburg to Philadelphia high-speed rail service. The Bureau of Community Development, has had responsibility for finding urban transportation improvements through SEPTA and other regional organizations in the state. The complete list of the Bureau's mass transportation funding activities plus those mass transportation projects which preceded the Bureau's inception is given in Table C-3. Note that most of the funds have gone to SEPTA and the Port Authority of Allegheny County. Altogether, the state has disbursed over $13 million for mass transportation improvements since 1963 of which $12,900,000 has been spent between June 30, 1965 and June 30, 1967.

Actually, the money spent thus far by the State on mass transportation in Pennsylvania has been but a small fraction of the amount needed. However, the mechanism is being established for massive funding of transit improvements. The Pennsylvania State Legislature has already approved the formation of a Transit Authority. The Transit Authority plans to issue $30 million per year of general obligation bonds for the next ten years. Proceeds are to be used in improving mass transit, primarily in Pittsburgh and Philadelphia. One of the purposes of forming an authority for such an activity was to circumvent the Pennsylvania State Constitution's limitation on debt.

Table C-3: Mass Transportation Projects Undertaken by The Pennsylvania State Government

NAME OF AGENCY	PROJECT NUMBER	1963-64 ALLOCATIONS		ACT 104 ALLOCATIONS*											
				RESEARCH	STUDIES & DEMONSTRATION PROJECTS	PROMOTION PROGRAMS	CAPITAL IMPROVEMENTS	TEMPORARY EMERGENCY SERVICE	USE OF FUNDS	STATE GRANT	FEDERAL GRANT	APPLICANT'S SHARE	TOTAL COST OF PROJECT	ADMINISTRATIVE ORDER NUMBER	DATE OF CONTRACT
		Act 48A 1963 $25,000	Act 26A 1964 $250,000	Section 5(1) $200,000	Section 5(2),i,ii $800,000	Section 5(2) iii $200,000	Section 5(2) iv $6,000,000	Section 6(1),(2) $5,700,000							
Southeastern Pennsylvania Transportation Authority	13							2,492,000	Pur. of Ser. on 7 PRR Lines from 1-1-66 to 6-30-67	2,492,000	None	1,671,000	4,163,000	20	3-22-66
Altoona and Logan Township Bus Authority	14				3,750				Engineering and Feasibility Study	3,750	None	3,750	7,500	21	4-7-66
Southeastern Pennsylvania Transportation Authority	15				35,000				SEP ACT II Demonstration Project	35,000	None	10,867	45,867	22	4-13-66
Westinghouse Air-Brake Company	16			79,169.37					Nigh-Speed Ground Transportation Study	79,169.37	None	None	79,169.37	23	4-21-66
Southeastern Pennsylvania Trans[illegible] Authority	17							353,200	Pur. of Ser. on certain lines of PSTC and Red Arrow	393,200	None	236,800	590,000	24	6-17-66
Southeastern Pennsylvania Transportation Authority	18				25,000				Avoidable Cost Study on Pennsylvania Railroad	25,000	None	25,000	50,000	25	8-16-66
Central Lycoming Planning Commission	19				6,800				Engineering and Feasibility Study Williamsport Area	6,800	None	3,200	10,000	26	8-9-66
Port Authority of Allegheny County	20						608,055		Phase II-Capital Improvements Study	608,055	See	Project	23	29	10-28-66
Louis T. Klauder and Associates	21			2,097.79					High-Speed Rail Transportation Study	2,097.79	None	None	2,097.79	27, 45, 46	8-16-66
Southeastern Pennsylvania Transportation Authority	22					50,000			Advertising and Promotion Study	50,000	None	50,000	100,000	28	9-27-66
Port Authority of Allegheny County	23						1,000,000		Phase II-Capital Improvements Program	1,000,000	11,290,334	5,243,363	18,141,752	29	10-28-66
Central Lycoming Planning Commission	25					5,000			Advertising and Promotion Program	5,000	None	5,000	10,000	31	9-21-66

*June 30, 1965 - June 30, 1967 - $12,900,000

Table C-3: Mass Transportation Projects Undertaken by The Pennsylvania State Government

	1963-64 ALLOCATIONS			ACT 104 ALLOCATIONS*											
NAME OF AGENCY	PROJECT NUMBER			RESEARCH	STUDIES & DEMONSTRATION PROJECTS	PROMOTION PROGRAMS	CAPITAL IMPROVEMENTS	TEMPORARY EMERGENCY SERVICE	USE OF FUNDS	STATE GRANT	FEDERAL GRANT	APPLICANT'S SHARE	TOTAL COST OF PROJECT	ADMINISTRATIVE ORDER NUMBER	DATE OF CONTRACT
		Act 48A 1963 $25,000	Act 26A 1964 $250,000	Section 5(1) $200,000	Section 5(2),i,ii $800,000	Section 5(2) iii $200,000	Section 5(2) iv $6,000,000	Section 6(1),(2) $5,700,000							
Southeastern Pennsylvania Transportation Authority	1	50,000							Mass Transportation Demonstration Project	50,000	291,667	145,833	437,500	1	4-15-64
Port Authority of Allegheny County	2	200,000							Transit Expressway Demonstration Project - Skybus	200,000	2,872,000	1,928,000	5,000,000	2	10-13-64
Southeastern Pennsylvania Transportation Authority	3		115,000						Mass Transportation Study	115,000	None	115,000	230,000	3,4,5,6,7	4-13-65
New Castle Transportation Authority	4		91,475						Mass Transportation Demonstration Project	91,475	365,898	91,474	548,847	8	8-13-65
Pennsylvania Economy League	5			3,648.38					State Long-Range Transportation Policy Study	3,648.38	None	None	3,648.38	9	8-13-65
Port Authority of Allegheny County	6						1,391,945		Phase 1 - Capital Improvements Program	1,391,945	5,567,780	1,720,395	8,680,125	10	10-4-65
Port Authority of Allegheny County	7				525,000				Rapid Transit Study	525,000	None	37,500	562,500	11	10-4-65
Southeastern Pennsylvania Transportation Authority	8		43,525		182,975				Mass Transportation Demonstration Project	226,500	2,977,000	1,598,500	4,742,000	12,15	11-22-65
Southeastern Pennsylvania Transportation Authority	9							128,000	Purchase of Service in Chester County from 12-5-65 to 12-31-66	128,000	None	64,000	192,000	16	11-29-65
Southeastern Pennsylvania Transportation Authority	10							280,000	Purchase of Service on PRR Levittown-Philadelphia 11-1-65 to 12-31-66	280,000	None	140,000	420,000	17	1-4-66
Southeastern Pennsylvania Transportation Authority	11							167,000	Pur. of Ser. PRR Chestnut Hill Line 10-1-65 to 12-31-65	167,000	None	92,000	259,000	18	1-4-66
Louis T. Klauder and Associates	12			14,993.49					Harrisburg-Phila. High-Speed Rail Service Study	14,993.49	None	None	14,993.49	19	12-15-65

*June 30, 1965 - June 30, 1967 - $12,900,000

	1963-64 ALLOCATIONS			ACT 104 ALLOCATIONS*											
NAME OF AGENCY	PROJECT NUMBER			RESEARCH	STUDIES & DEMONSTRATION PROJECTS	PROMOTION PROGRAMS	CAPITAL IMPROVEMENTS	TEMPORARY EMERGENCY SERVICE	USE OF FUNDS	STATE GRANT	FEDERAL GRANT	APPLICANT'S SHARE	TOTAL COST OF PROJECT	ADMINISTRATIVE ORDER NUMBER	DATE OF CONTRACT
		Act 48A 1963 $25,000	Act 26A 1964 $250,000	Section 5(1) $200,000	Section 5(2),i,ii $800,000	Section 5(2) iii $200,000	Section 5(2) iv $6,000,000	Section 6(1),(2) $5,700,000							
New Castle Transit Authority	26					7,250			Advertising and Promotion Program	7,250	None	7,250	14,500	32	11-18-66
Southeastern Pennsylvania Transportation Authority	27							1,379,800	Purchase of Service Program with Reading Company	1,379,800	None	925,200	2,305,000	33	12-1-66
City of Lancaster	28					9,000			Advertising and Promotion Program	9,000	None	9,000	18,000	34	10-31-66
Southeastern Pennsylvania Transportation Authority	29						2,035,000		Urban Mass Transportation Equipment Aquisition Agreement	2,035,000	13,506,667	2,600,000	20,260,000	35	11-3-66
City of Erie	30							10,000	Pur. of Ser. for Period 9-1-66 to 6-30-67	10,000	None	5,000	15,000	36	3-3-67
Southeastern Pennsylvania Transportation Authority	31						300,000		Reconstruction and Repair of Reading Company Viaduct	300,000	900,000	600,000	1,800,000	37,38,39	2-20-67
Port Authority of Allegheny County	32					50,000			Promotion Program	50,000	None	50,000	100,000	42	4-14-67
Port Authority of Allegheny County	33				20,000				Study of Central Core Distribution of Passengers	20,000	None	4,218	24,218	43	4-27-67
Southeastern Pennsylvania Transportation Authority	34						218,333		Hatboro-Warminster Electrification Project	218,333	655,000	436,667	1310,000	49	6-22-67
Port of Authority of Allegheny County	23A						1,214,529		Completion of Phase II-Capital Improvements Program	1,214,529	See	Project	23	50	6-6-67
City of Philadelphia	35						302,453.97		Construction of Center City Tunnel Reading Ter. to PRR	302,453.97	22,990,667	10,876,000	46,800,000	51	6-22-67

*June 30, 1965 - June 30, 1967 - $12,900,000

Table C-3: Mass Transportation Projects Undertaken by The Pennsylvania State Government

	1963-64 ALLOCATIONS			ACT 104 ALLOCATIONS*											
NAME OF AGENCY	PROJECT NUMBER			RESEARCH	STUDIES & DEMONSTRATION PROJECTS	PROMOTION PROGRAMS	CAPITAL IMPROVEMENTS	TEMPORARY EMERGENCY SERVICE	USE OF FUNDS	STATE GRANT	FEDERAL GRANT	APPLICANT'S SHARE	TOTAL COST OF PROJECT	ADMINISTRATIVE ORDER NUMBER	DATE OF CONTRACT
		Act 48A 1963 $25,000	Act 26A 1964 $250,000	Section 5(1) $200,000	Section 5(2),i,ii $800,000	Section 5(2) iii $200,000	Section 5(2) iv $6,000,000	Section 6(1),(2) $5,700,000							
BALANCE				100,090.97	1,475	78,750	0	890,000							
TRANSFERRED TO CAPITAL IMPROVEMENTS				100,090.97	1,475	78,750	0	890,000							
FINAL BALANCE 6-30-67				0	0	0	0	0							

*June 30, 1965 - June 30, 1967 - $12,900,000

At the present, the Bureau of Community Development has no specific plan for disbursing the $30 million per year which would be raised by the Transit Authority. Presumably, the funds would chiefly support planned capital improvement programs which have already been established at Pittsburgh and at Philadelphia (a discussion of transportation planning in the two largest metropolitan areas of the State will follow). The Bureau had been authorized to finance only 1/6 of capital improvement programs, the remainder to have come from local authorities and federal government in the shares of 1/6 and 2/3 respectively. However, a new authorization will soon permit the Bureau of Community Development to undertake a larger share of transit financing. Most recently, financing of capital improvements has slackened considerably because the federal government's policy of withholding transportation funds until the threat of excessive inflation is diminished.

DEPARTMENT OF COMMERCE

The Department of Commerce encourages and assists in the location and growth of new industries in Pennsylvania. This Department also has responsibility for promoting the Commonwealth as a tourist and vacation state. Before July 1, 1966, the Department of Commerce had urban renewal, economic opportunity (OEO) and mass transit development responsibility; after July 1, 1966, the latter three functions were switched to the new Department of Community Affairs.

The Department of Commerce is particularly interested in developing regions of the State where current employment opportunities are poor, such as in Appalachian Counties. The Department is the Commonwealth's principal coordinating agency with the Appalachian Regional Commission (See Appendix B).

The Appalachian Regional Commission has established a program to work to build short access roads with the Department of Commerce for industries which would locate manufacturing enterprises in Appalachian counties. To date, the program has not functioned well. Delays in funding do not provide the quick answers which businessmen want for decision making. Several neighboring states have abandoned the Appalachian Regional Commission access road program and authorized their Departments of Commerce to work closely with State Highway Departments in quickly providing certain roads required as prerequisite for plant construction (Kentucky has such an arrangement). The Pennsylvania Department of Commerce and the Department of Highways do have working agreements, but no funding or mechanism for quick action in building access roads.

The Department of Commerce is also desirous of improving roads to major manufacturing communities, which to date have been by-passed by major road construction. Examples of such communities are Altoona and Johnstown. The Appalachian Development Highways planned by the Appalachian Regional Commission may help some communities in Appalachia such as Altoona (See Figure 3-2b). However, the Appalachian Regional Commission has, like most federal agencies, experienced difficulty of late in funding major projects which they have proposed.

Other functions of the Department of Commerce include industrial development loan programs and assistance for such endeavors as developing and promoting industrial parks. In 1965-66, the Department made 120 loans totaling over $32 million with primary purpose of creating new job opportunities. They hope to finance even larger and more numerous projects in the future.

The location where the Department of Commerce will likely place primary promotional effort in future years is Olmsted State Airport. This newly acquired airport was formerly used exclusively by the U.S. Air Force primarily for logistic support of military operations. The airport premises contain many buildings and networks of railroad tracks which could provide the nucleus of a major industrial park.

DEPARTMENT OF FORESTS AND WATERS

The Department of Forests and Waters administers more than 1,904,631 acres of Pennsylvania forest lands. Its administrative functions are broad and encompass regulation, conservation and recreation for the public.

The Department is responsible for allocating public water supplies to various communities, *i.e.*, regulating rates of flow in pipelines from surface water supplies to community water supply agencies. The Department works through the Navigation Commission for the Delaware River to regulate pilots, warves, ships, and vessels using the tidal waters of Pennsylvania. Since 1929, the Department has been charged with the responsibility for developing and maintaining a 60-mile Delaware Canal between Easton and Bristol. Most recently, the Department has taken an interest in determining the feasibility of constructing navigation facilities in the lower Schuylkill River and the Manayunk Canal at Philadelphia. To date, however, no commitment has been made for undertaking such construction. At any rate, the Department is continuing to carry out its dredging operation on the Schuylkill River and issuance of boating permits on waters where such permits are required.

The recreation aspects of the Department's activities are managed through four regional park offices. These offices maintain and protect over 1/4 million acres in 156 state recreation areas. State forest maintenance projects include over 3,600 miles of roads and about 2,800 miles of trails.

The real estate functions include inspection and purchase of additional land for new or expanded State parks. To date, the Department of Forest and Waters has purchased more than 60,000 acres of land at about 30 locations with PROJECT 70 funds (See functions of the State Planning Board in this Appendix for details on PROJECT 70 Funds). Many of the new acquisitions have been near the southern and western borders of the Commonwealth, where public lands are less abundant than in the central and northern regions of the State (See Figure 3-6).

DEPARTMENT OF MILITARY AFFAIRS

The only activities of the Department of Military Affairs which are relevant to operations of a PennDOT are its airport construction and improvement programs. These programs are funded through the Pennsylvania Aeronautics Commission. This Department is the only one in state government which can function to match federal funds in carrying out the National Airport Plan (See Table B-2).

In fiscal year 1965-66, the Aeronautics Commission received $1.8 million from the General Fund for disbursement by the Department of Military Affairs as matching money (25% state; 25% local; 50% federal——See Appendix B). In 1966-67, the Department budgeted for only one airport improvement, $330,000 for construction at the Wilkes-Barre-Scranton Airport.

THE PENNSYLVANIA TURNPIKE COMMISSION

The Pennsylvania Turnpike Commission is a self-supporting organization which has been empowered by the State of Pennsylvania to finance, build and maintain highways. The Commission coordinates its activities with the State Highway Department, but is not functionally a part of that Department.

The Pennsylvania Turnpike Commission originated as a result of the need to finance and build 4-lane intercity highways. Such highways could not easily be built by the Highway Department of the Commonwealth because of limitations on State debt (See Appendix F), and because there was no significant federal support for State highway departments prior to 1956. The Commission completed construction of 470 miles of Turnpike between the 1930's and November, 1957. Its first 160 miles of construction over the mountains between Carlisle and Irwin were considered engineering marvels, and offered perhaps the best driving conditions in mountainous terrain in the world upon completion in 1940. The Commission's Turnpike network now runs from the Ohio border past Pittsburgh to the New Jersey border at Philadelphia, and from Philadelphia northward past Scranton. Plans were underway for further extensions, but the Federal Highway Act of 1956 shifted the burden of interstate highway construction to the Pennsylvania Department of Highways. The last expansion of its network was completed by the Commission in November, 1957, when the 110-mile Northeastern Extension was completed.

Since 1957, the Commission has limited its activities to upgrading its network. At the present, the Commission is building supplementary two-lane tunnels so that four lanes of traffic can be acommodated. It is also resurfacing sections of east-west Turnpike, but no substantial widening of lanes is foreseen in the immediate future. The east-west Turnpike does not meet federal interstate standards for lane-widths and median design for new construction. The heavy traffic on some sections of the Turnpike network combined with the narrowness of lanes has led to capacity deficiencies on some sections (See Table C-1a), particularly near Pittsburgh and Philadelphia.

A solution to the jaming on the 6-lanes of the Turnpike north of Philadelphia has been proposed in the form of a "Mini-Pike." The "Mini-Pike" would be a toll road from Downingtown to the New Jersey line, which would approximately parallel the existing route of the eastern extension of the Turnpike. When the eastern extension was completed from Valley Forge to the New Jersey line in 1954, the Commission assumed that its function would be primarily for routing through traffic past the growing congestion in Montgomery and Chester Counties. Instead, the eastern extension has been a great catalyst to industrial and residential expansion in the two counties and in Bucks County, such that it has generated a heavy commuter load. The Commission apparently does not plan to open a "Mini Pike" before 1975, but is currently conducting an engineering investigation of construction and routing. The Commission feels that adding to the existing 6 lanes would present safety problems and represent less capacity improvement per dollar expended than building a completely new link. There is little doubt that substantial added capacity would be utilized. The completion of the controversial Midcounty Expressway (the so-called Blue Route through Chester County) will dump thousands of cars daily onto the Turnpike system at whatever point is chosen for connection. Commission administrators say that they will have to rely on state and federal assistance for the first time since 1939 in meeting the capacity requirements. The estimated $300 million cost of the "Mini-Pike" would reportedly be large enough to preclude another bond issue by the Turnpike Commission.

The second major Commission plan for the Philadelphia Area involves building a Southeastern Extension of the Turnpike from Downingtown to Chester. This new link would provide improved access to the Center City Philadelphia (by connecting with a new Interstate 95) and to International Airport. Proponents of the link say that it would relieve some of the traffic overlaps now carried on the Schuylkill Expressway into Center City. The Commission has already received legislative approval to build a southeastern link, but has not committed any resources to initiating its construction. A Southeastern Extension of the Turnpike *will not likely* be opened prior to 1975 unless a Penn DOT offers strong and immediate financial support.

The Commission will continue to make safety improvements in its network, using internally generated funds. One significant safety improvement to be made in 1968 and 1969 is the addition of steel dividers on the Northeast Extension over a distance of about 31 miles. The cost of this project alone will be almost $1 million.

THE PUBLIC UTILITIES COMMISSION

The Public Utilities Commission (PUC) was formed by an act of the Pennsylvania Legislature in 1937. The PUC consisted of the members appointed by the Governor. Its powers are broad, encompassing such activities as ruling on water purity and regulating rates charged by communication, power, and transportation companies.

The PUC makes no plans as such, but does signigicantly affect transportation development by its interpretation of rules and regulations. A comprehensive survey of the PUC activities and its impact on the Commonwealth was made by Professor Alexander Volotta in 1967 (*Pennsylvania Transportation Regulation, A Comparison and Evaluation* Alexander Volotta, Pennsylvania State University, August 1967.) One of the more controversial aspects of PUC activities, administering the so-called "General Order 29" of Public Utility Law, was discussed in some detail by Professor Volotta. It seems that enforcement of General Order 29 is likely promoting some inefficiencies because it prohibits truckers from negotiating through rates and deliveries. This occurs even though certain combinations of truckers may have authorization for operation on routes that could conveniently be "tacked" together to give a shipper through service (See Appendix H-2 for more detail on pros and cons of General Order 29.)

It is interesting to note that PUC has authority for controlling and administering passenger service within the Commonwealth with one exception. The PUC has no control over the activities of regional public agencies established to operate public transit systems on a non-profit basis. Thus for example, the Southeastern Pennsylvania Transportation Authority (SEPTA) can add and drop services or change fare structures without the necessity of clearing its plans with PUC.

MISCELLANEOUS PROGRAMS AND COMMISSIONS

There are many state commissions which conduct planning activities related to transportation development. These commissions also often act as channels for funding the programs of departments of state government. Some of the more prominent planning commissions and funding programs which may be of interest to a PennDOT are as follows:

Name of Commission or Program	Activity	1966-67 Budget $
Commission on Interstate Cooperation	Assists in the promotion of interstate cooperation and sends one representative to the Board of Management of the Council of State Government	20,000
Interstate Advisory Committee on the Susquehanna River Basin	Founded in 1962 to foster proper development of the Susquehanna River Basin with Maryland and New York	36,000
Interstate Commission on the Potomic River Basin	Formed in 1945 to control pollution in the Potomac River, Pennsylvania, Maryland, District of Columbia, Virginia and West Virginia Cooperate	3,000
Ohio River Valley Water Sanitation Commission	Controls pollution in the Ohio River	20,000
Great Lakes Commission	Promotes a balanced program of development use, and conservation of Great Lakes Basin water resources	12,000
Port of Philadelphia Maintenance	Maintain, repair and improve the Port of Philadelphia	600,000
Port of Erie	Contributes to Erie Port Commission for the maintenance, repair, and improvement of the Port of Erie	250,000

(continued from previous page)

Delaware River Basin Commission	A regional agency representing Pennsylvania, New York, New Jersey, Delaware, and the United States Government. Plans and manages the development of the water and natural resources of the Delaware River Basin	385,000
City of Philadelphia Bicentennial Celebration	Funds for planning and promoting the Bicentennial Celebration of American Independence	150,000
Pennsylvania Aeronautics Commission	Funds program of the Department of Military Affairs which pertain to airport maintenance and construction. Matches 25% contribution of local government to secure 50% financing of airport improvements. Administers five airports.	730,000
Junkyard Control	Funds highway beautification program	1,200,000
Roadside Landscaping and Scenic Development	Funds highway beautification program	2,000,000
Control of Roadside Advertising	Funds highway beautification program	1,200,000
Grade Crossing Protection	Funds state's share of cost of installing safety devices at railroad crossings up to a maximum of $7,000 per installation	15,000

LOCAL GOVERNMENT AGENCIES AND LOCAL NON-PROFIT AUTHORITIES

The number of local planning agencies, chambers of commerce, and county and municipal departments which are engaged in transportation-related activities throughout the Commonwealth are too numerous to warrant full discussion. Thus, it seems advisable to limit discussion to plans and activities of those organizations which can greatly influence transportation in the vicinity of some of Pennsylvania's largest cities: Philadelphia, Pittsburgh, Erie, and Harrisburg.

PHILADELPHIA

Philadelphia suffers the same misfortune that plagues several other cities in the east coast "Megalopolis." The transportation requirements of the Philadelphia Area are so complex and so extensive that many planning and action organizations have sprung up through the years to attempt improvements. The result has been conflict and, in many cases, stagnation of transportation development. Some of the organizations which have engaged in transportation development include the Philadelphia Port Corporation, the Philadelphia City Planning Commission, the Delaware Valley Regional Planning Commission (DVRPC), the Delaware River Port Authority (DRPA), the Southeastern Pennsylvania Transportation Authority (SEPTA), the Philadelphia Transit Company (PTC), the Philadelphia Suburban Transportation Company (The Red Arrow Line), the Reading Railroad, the Pennsylvania Railroad (now the Penn Central Railroad), and a host of small local bus companies and planning associations. However, one organization, the Southeastern Pennsylvania Transportation Authority (SEPTA) seems to be emerging as the dominant force in passenger transportation development in the Philadelphia Area.

Southeastern Pennsylvania Transportation Authority

SEPTA was formed in 1963 by an act of the Pennsylvania Legislature (See Appendix F). SEPTA's chief purpose is to absorb existing metropolitan transportation compenies in the five-county area of Southeastern Pennsylvania, and to mold them and expand them into a coordinated system of transportation service for the residents of the area. Until May, 1968, SEPTA's most noteworthy accomplishment was in maintaining and improving rail commuter service by administering to railroads and the PTC, subsidies funded through the Bureau of Community Development (State Government). However, in May, 1968, SEPTA successfully gained control of the PTC (the largest privately owned bus company in the world) when the PTC's stockholders accepted a $48 million offer by SEPTA. Reportedly, SEPTA would also like to acquire the Philadelphia Suburban Transportation Company and the commuter service of the Reading Railroad and the Penn Central railroad. SEPTA's objectives reportedly also include operation, but not ownership of high-speed rail commuter service between Center City Philadelphia and towns in New Jersey. The highlights of SEPTA's major plans are shown in Table C-4.

While the projects listed by SEPTA (Table C-4) require about $500 million of funding by 1977, their total funds needs could be much greater. This would be true if they should purchase other transportation organizations and assume responsibilities as suggested by their objectives.

SEPTA now has authority to float bonds for such activities as purchasing the PTC. However, it will likely have great difficulty in carrying out its plan without massive financial assistance from a PennDOT and federal agencies. SEPTA's revenues will likely not impress potential purchasers of bonds unless it can make substantial cutbacks in operating costs. However, this would likely defeat SEPTA's purpose of providing improved service.

Table C-4

SEPTA'S PROPOSED PROJECTS THROUGH 1977

Short Range Plans (July 1967 to July 1969)

Project	Total Cost (millions)
Railroad Improvements	
*New cars (105)	28.4
Car rehabilitation	2.5
Car repair facilities	4.4
Service Extension to Hatboro	1.3
Service Extension to Newtown	1.5
	38.1
Transit	
New buses and other purchases	33.8
Multi-purpose Improvements	
**Center City rail link	46.8
Connecting Penn Central and Reading R.R. Terminals	
Parking and Shelters	5.4
Miscellaneous improvements	4.0
***Total Funds Needs to 1970	128.1

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*Includes approximately $4.5 million for purchase of high-speed rail cars to run between Philadelphia and Harrisburg

**The two railroads have agreed to underwrite debt of $110 million for construciton of the link.

*** Does not include $48 million required for purchase of PTC

Source: *Capital and Operating Programs, 1967-69,* SEPTA, 1967.

Long-Range Plans (1970 to 1977)

Project	Total Cost ($ millions)
1. Broad Street Subway - North and South Extension	106 ($524 million of progress to be made by 1977)*
2. Provide all new cars for operation on the Reading	50.5 ($270,000/car as required SEPTA expects a 50% increase in riders by 1977)*
3. Provide expanded parking facilities at transit and railroad stations	25
4. Electric trolley cars and interurbans	5
5. Communication equipment for trains and trolley	4.4
6. Broad-Ridge-Locust Subway	13.8
7. Track and signal improvements for railroads	6.2
8. Station improvements for railroads	2.3
9. Additions and improvements to the Center City interterminal rail link via tunnel	5.0
10. A Mini-bus demonstration	1.0
11. Systemwide grade crossing elimination at 15% of cost (SEPTA assumes that PennDOT will provide the remaining 85% of cost)	10.6

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*Source: Adapted from *Capital and Operating Programs*, 1970-77, SEPTA, 1967.

Project	Total Cost ($ millions)
12. Railroad extensions to Norristown and other communities (as recommended in the Penn Jersey Study)	2.9
13. On-street shelters for transit riders	2.1
14. Track replacements for select segments of the trolley system	15.0
15. Complete replacement of buses for small transit companies in outlying areas	5.2
16. Addiiton to track capacity of the Reading Railroad in the vicinity of Wayne Junction	20.0
17. Extension of the PST Company System to King of Prussia via the Chester Valley Branch of the Reading Railroad	1.3
18. Extensions of the PST Company and improvements in the vicintiy of Media in Chester County	2.8
19. Construction of new high-level platforms at railroad stations	11.0
20. Railroad Connection to Philadelphia International Airport	20.0
21. Improved transit connections west of 69th Street	6.8
22. Replacement of the PTC Company barn at Germantown	2.8
23. High-speed rail connection at North Philadelphia between the Reading and PRR to facilitate transfer of cars bound for Harrisburg	29.3

Project	Total Cost ($ millions)
24. Replacement of the Frankford Elevated rail lines	65.0
25. Extend service off the Chestnut Hill line over the PRR tracks to Fort Washington; support with a large parking lot	5.0
26. Reconstruct the 69th Street Terminal	5.2
27. Double track sections of the PST lines to Sharon Hill and Media	.5
28. Provide electric cars for use on a Chestnut Street Mall in 1976	4.5
29. Replacement of the PTC Company barn at Woodland	2.0
Totals	431.2

The Delaware Valley Regional Planning Commission

The DVRPC grew out of the recognition of the need for continuous local planning. It evolved as a follow-on to the Penn Jersey Study of the socio-economic structure and transportation needs of the Greater Philadelphia-Camden-Trenton Area.

Now the DVRPC is the chief planning arm of the Pennsylvania Department of Highways for the five-county area of Southeastern Pennsylvania. The highway plans of the DVRPC for its regional area are largely reflected in the ultimate 1990 highway network which appears in Figure 3-2b. The optimum network plan was developed by testing various combinations of railroad, highway, and mass transit networks on a model set-up on DVRPC's computers. The estimated funds needs for carrying out completion of freeway construction and implementing SEPTA's most needed mass transit projects by 1985 range from $1.9 billion to about $3.7 billion, according to recent calculations.

At the present the DVRPC is directing much of its effort toward encouraging immediate improvements at severe bottlenecks. In particular, the organization is advocating expanding the Schuylkill Expressway from four lanes to eight lanes from Center City Philadelphia to City Line Avenue by 1970. The total cost of the capacity improvement would be about $7.8 million.

The Philadelphia City Planning Commission

The Planning Commission has placed transit in a key role in its planning process. Transit, they say, must preserve the "fluidity of movement" in Center City Philadelphia. The Planning Commission is focusing its attention on development of a linear complex between the Delaware River and the Schuylkill River. Hopefully, the complex will become the "Main Street of Megalopolis."

Plans are under way to tie in local transportation with the Penn Central's 30th Street Station where the high-speed trains of the Northeast Corridor will stop enroute between Washington and New York City. The 30th Street Station is located at the western-most end of the complex under development. One idea being considered for a tie-in with the 30th Street Station is a new form of transportation which would traverse the 30-block east-west axis of the Center City complex. The Planning Commission hopes to accomplish this by eventually blocking off Chestnut Street to private automobiles and using that thoroughfare for some new form of public vehicle. The ideal new public vehicle is to be odorless and noiseless. It will not require tracks or wires, will not take up much space, and will not interfere with pedestrian traffic.

Other proposals of the Planning Commission include placing a glass or plastic cover over much of Market Street, extending the subterranean shopping arcades at Penn Center, and installing pedestrian conveyors at strategic locations.

The Delaware River Port Authority

The DRPA's activities are roughly divided into two categories: development of ports along the Delaware River, and providing transportation facilities between states across the Delaware River.

The DRPA now derives most of its operating revenue from bridge tolls. However, it will soon add considerably to its revenues by collecting fares in the cash boxes of a new transit line which runs between Lindenwold, New Jersey, and Center City Philadelphia. The new service will start in the fall of 1968 and tie in directly with the existing Philadelphia subway system (See Appendix A for details on the advanced technology of the controls and equipment).

The second principal activity of DRPA, port development, is the more controversial of its endeavors. The controversy arises because the DRPA, after exhaustive studies of industrial needs and environmental assets, plans to develop new container ports at Camden, New Jersey, and Chester, Pennsylvania. Such ports would conflict with the port development projects already undertaken by the Philadelphia Port Corporation (PPC), however. The DRPA maintains that their plan is preferable in that it places facilities where combinations of land availability, need for service, and lack of conflict with alternative land uses are optimum. The PPC maintains that the DRPA plan would displace 3,000 longshoremen from jobs in Philadelphia and lead to a deterioration of shipping-related service industries in Philadelphia. The PPC development plan currently has the support of the Pennsylvania legislature and virtually all Philadelphia City officials. Meanwhile, the New Jersey legislature has voted full approval of the DRPA plan and authorized development of the upgrading of the three-berth Camden Marine Terminal across the river from Philadelphia. The DRPA has already earmarked $10 million to purchase the Camden Terminal and suitable land at Chester regardless of the fact that PPC will soon complete construction of the first of its modern terminals. According to its charter, the DRPA has authority to develop ports from Trenton, New Jersey, to the Atlantic Ocean.

The Philadelphia Port Corporation

The PPC was formed in 1964 in response to an identified need to help the Port of Philadelphia regain its position as a major general carrying post. PPC was funded with a $600,000 grant from the city of Philadelphia and a matching $600,000 from the Commonwealth. In 1965, the PPC floated a $70 million bond issue to provide the capital needed to carry out three major port developments as follows:

Name of Terminal	RR Service	Planned Berths	Time Scheduled
Tioga	B&O Penn Central Reading	7	1969 (Have already broken ground)
Packer Avenue	Reading Penn Central	3	In full operation June, 1968
Packer Avenue		3	Plan to acquire additional 50 acres of land in 1969 to support an additiona three berths
Penrose		4	Plan to purchase land above the Schuylkill River in late 1969

It seems that Philadelphia has excess capacity for loading and unloading ships, but the facilities are very inefficient. For the most part, the existing finger piers were built over 50 years ago when freight was brought in by rail car and unloaded by hand. Now, about 90% of the freight moves to or from the pier by truck. The most recent trend has been toward containerizing general cargo so that it can be moved between shore and ship without manual handling. The PPC's Packer Avenue terminal will be the first in Philadelphia designed especially for modern freight-handling needs. However, even that terminal may not be adequate unless sufficient large container-handling cranes are purchased to quickly load and unload ships. PPC plans call for buying one large crane initially, but at least two cranes at $1 million each will likely be needed to assure shipping companies that they will not be delayed by queing problems.

PPC plans to emphasize container movements and "break-bulk" handling, *i.e.*, preparing for shipment those goods which are not easily adapted to containerization.

Airport Management

The Philadelphia International Airport now ranks 20th in the nation in terms of daily flights according to a recent FAA report. While the relatively low utilization ranking of the airport in relation to Greater Philadelphia's size as the 4th largest metropolitan community in the United States is not impressive, the airport's growth in utilization is noteworthy. The increase in commercial flights between 1957 and 1967 was 239 percent. During the same period air freight movement at the airport rose 350 percent. The continuing increases in demand force the airport management to continually expand and improve its facilities. The current Six-Year Plan for changes at Philadelphia International Airport are shown in Table C-5. Some of the important aspects of the plan which are not specifically mentioned include the construction of a "Cargo City Complex" near the Delaware River on the Chester side of the Airport and the renovation of the interior to accomodate rail passenger cars (See SEPTA plans).

One alternative for relieving the strain on capacity to be created by Jumbo Jets is to move passengers swiftly by rail from a parking area (perhaps at the Civic Center) to the airplanes. However, this scheme would also require removing many of the services from the airport to facilitate throughput. Airport officials may be concerned lest their $5 million per year in concession rental revenues be removed by "too much" efficiency at the airport. The concession rentals at International Airport are very important in financing its operation and providing surplus to care for the annual deficit incurred at North Philadelphia Airport.

Operation of North Philadelphia Airport is an important aspect of the air operations at Philadelphia. That airport now accomodates over 170,000 aircraft per year (mostly small private planes).

Thus, North Philadelphia Airport removes a burden which would otherwise fall on International Airport. The Six-Year Plan for North Philadelphia Airport calls for $1,675,000 worth of work:

1. Extend runway 6-24.
2. Extend utilities to new areas.
3. Widen runway 15-33 and construct holding apron: no terminal improvement work is scheduled.

to be Made at Philadelphia International
Airport and North Philadelphia Airport

PROJECTS	Estimated Change in Annual Operating Cost	Total Estimated Cost	Cost Thru 1967 Capital Budget	Cost Scheduled Six-Year Period	RECOMMENDED AND SCHEDULED FOR SIX-YEAR PERIOD						Cost to Complete Beyond 1973
					1968	1969	1970	1971	1972	1973	
PHILADELPHIA INTERNATIONAL AIRPORT											
Study of aviation facilities requirements for Philadelphia metropolitan area		50,000		5,000x 45,000*	5,000x 45,000*						
Terminal building---international area---expansion and related facilities		457,000	43,700x 393,300	2,000x 18,000	2,000x 18,000						
Parallel instrument runway 9-27---construction	+ 50,000	13,039,554	4,026,375f 328,465s 384,671x 3,462,043	2,444,000f 244 400x 1,776,600* 423,000	470,000f 47,000x 423,000		1,974,000f 197,400x 1,776,600*				
Taxiways parallel to runways 17-35 and 9-27		2,556,000		678,000f 67,800x 135,000* 475,200	528,000f 52,800x 475,200		150,000f 15,000x 135,000*				500,000 60,000 540,000
Extension of utilities, access roads and taxiways to new areas		200,000		20,000x 180,000*	10,000x 90,000*		10,000x 90,000*				Indefinit
Terminal building---interior construction		75,000		7,500x 45,000* 22,500	2,500x 22,500		2,500x 22,500*		2,500x 22,500*		Indefinit

f Federal
s State
pe Delaware River Port Authority
a Assessments
+x Self-sustaining operating revenue
+* Self-sustaining new loan

+ Self-sustaining available loan funds
x Tax-supported operating revenue
* Tax-supported new loan
Tax-supported available loan funds
(f) Federal planning advance
p Non-cash grants-in-aid

Source: The Management of Philadelphia International Airport

(CONTINUED-2)

Table C-5: *Scheduled Improvements to be Made at Philadelphia International Airport and North Philadelphia Airport*

PROJECTS	Estimated Change in Annual Operating Cost	Total Estimated Cost	Cost Thru 1967 Capital Budget	Cost Scheduled Six-Year Period	RECOMMENDED AND SCHEDULED FOR SIX-YEAR PERIOD						Cost to Complete Beyond 1973
					1968	1969	1970	1971	1972	1973	
PHILADELPHIA INTERNATIONAL AIRPORT											
Rehabilitation and modernization of existing instrument runway 9-27 --- including taxiways		1,640,000		820,000f 82,000x 738,000*				60,000f 6,000x 54,000*	760,000f 76,000x 684,000*		
Acquisition of land --- north of Industrial Highway		1,766,000	600x 5,400	150,000x 1,350,000*				50,000x 450,000*		100,000x 900,000*	26,000x 234,000*
Helicopter landing facilities	+ 2,000	200,000		100,000f 10,000x 90,000*					100,000f 10,000x 90,000*		
Runway 17-35---Northward and southward extensions		2,116,000		85,000f 8,500x 76,500*					85,000f 8,500x 76,500*		973,000f 97,300x 875,700*
Church Creek enclosure --- west of Island Avenue to fixed base area		3,372,000		5,000x 45,000*					5,000x 45,000*		332,200x 2,989,800*
New air-freight terminals including access and utilities		19,388,000	7,125,000+	9,688,000+* 2,525,000+	2,525,000+		9,688,000+*				
Northwest area---site preparation		10,025,000	4,000,000+	2,475,000+* 3,550,000+	1,218,000+	2,332,000+	2,475,000+*				
Terminal building---expansion and modernization		77,523,000	2,400,000+	37,438,000+* 37,685,000+		37,685,000+	3,200,000+*	34,238,000+*			

f Federal
s State
pa Delaware River Port Authority
a Assessments
+* Self-sustaining new loan

+ Self-sustaining available loan funds
x Tax-supported operating revenue
* Tax-supported new loan
Tax-supported available loan funds
g Non-cash grants-in-aid

Source: The Management of Philadelphia International Airport

Table C-5: *Scheduled Improvements to be Made at Philadelphia International Airport and North Philadelphia Airport*

PROJECTS	Estimated Change in Annual Operating Cost	Total Estimated Cost	Cost Thru 1967 Capital Budget	Cost Scheduled Six-Year Period	RECOMMENDED AND SCHEDULED FOR SIX-YEAR PERIOD 1968	1969	1970	1971	1972	1973	Cost to Complete Beyond 1973
PHILADELPHIA INTERNATIONAL AIRPORT											
South hangar area --- site preparation		6,041,000		3,041,000+*		989,000+*	459,000+*		1,088,000+*	505,000+*	3,000,000+*
				675,000+*		115,000+*	140,000+*	140,000+*	140,000+*	140,000+*	
				95,000+	95,000+						
			69,938x	30,000x	15,000x	15,000x	15,000x	15,000x	15,000x	15,000x	
				675,000*		135,000*	135,000*	135,000*	135,000*	135,000*	
Engineering and administrative costs		2,369,376	629,438	135,000	135,000						Indefinite
			4,026,375f	4,127,000f	998,000f		2,124,000f	60,000f	945,000f		1,573,000f
			328,465s								
				53,317,000+*		1,104,000+*	15,962,000+*	34,378,000+*	1,228,000+*	645,000+*	3,000,000+*
			13,525,000+	43,855,000+	3,838,000+	40,017,000+					
			498,909x	692,200x	134,300x	15,000x	239,900x	71,000x	117,000x	115,000x	515,500x
				5,156,100*	135,000*	135,000*	2,159,100*	639,000*	1,053,000*	1,053,000*	4,639,500*
			4,490,181	1,073,700	1,073,700						
PHILADELPHIA INTERNATIONAL AIRPORT TOTAL	+ 52,000	140,817,930	22,868,930	108,221,000	6,179,000	41,271,000	20,485,000	35,148,000	3,343,000	1,795,000	9,728,000

f Federal
s State
pa Delaware River Port Authority
a Assessments
+x Self-sustaining operating revenue
+* Self-sustaining new loan

+ Self-sustaining available loan funds
x Tax-supported operating revenue
* Tax-supported new loan
Tax-supported available loan funds
(f) Federal planning advance
g Non-cash grants-in-aid

Source: The Management of Philadelphia International Airport

Table C-5: Scheduled Improvements to be Made at Philadelphia International Airport and North Philadelphia Airport

PROJECTS	Estimated Change in Annual Operating Cost	Total Estimated Cost	Cost Thru 1967 Capital Budget	Cost Scheduled Six-Year Period		RECOMMENDED AND SCHEDULED FOR SIX-YEAR PERIOD						Cost to Complete Beyond 1973
						1968	1969	1970	1971	1972	1973	
NORTH PHILADELPHIA AIRPORT												
Extension of runway 6-24 and parallel taxiway	+ 35,000	6,096,000		762,500f 76,250x 344,250* 342,000		380,000f 38,000x 342,000	382,500f 38,250x 344,250*					2,285,5 228,5 2,056,9
Extension of utilities to new areas		75,000		7,500x 45,000* 22,500		2,500x 22,500		2,500x 22,500*		2,500x 22,500*		Indefinit
Widen taxiway parallel to runway 15-33 and construct holding apron		863,000		37,500f 3,750x 33,750*						37,500f 3,750x 33,750*		394,0 39,4 354,6
				800,000f 87,500x 423,000* 364,500		380,000f 40,500x 364,500	382,500f 38,250x 344,250*	 2,500x 22,500*		37,500f 6,250x 56,250*		2,679,5 267,9 2,411,5
NORTH PHILADELPHIA AIRPORT TOTAL	+ 35,000	7,034,000		1,675,000		785,000	765,000	25,000		100,000		5,359,0

f Federal
s State
pa Delaware River Port Authority
a Assessments

+ Self-sustaining available loan funds
x Tax-supported operating revenue
* Tax-supported new loan
Tax-supported available loan funds

Source: *The Management of Philadelphia Internationa Airport*

PITTSBURGH

The Pittsburgh Area is fortunate, in many respects, because its isolation from other large communities, its distance from the state line, and its strong alliance of concerned citizens has resulted in great unity of purpose. Among the local organizations in the Pittsburgh Area which are giving significant guidance to transportation development are the Port Authority of Allegheny County, the Southwestern Pennsylvania Regional Planning Commission (SPRPC), the Management of the Greater Pittsburgh Airport, the Urban Transportation Development Council of the Greater Pittsburgh Chamber of Commerce, and the Pittsburgh Urban Transit Council.

The Pittsburgh Urban Transit Council is a recently formed organization which has as its purpose the promotion and development of Rapid Transit in the Pittsburgh Area. The Urban Transportaiton Development Council is made up chiefly of representatives from private companies who wish to introduce new transportation hardware and systems (some of which are discussed in Appendix A). The other three organizations cited have been in existence for a number of years and have generated enough plans and actions to warrant more detailed discussion.

Port Authority of Allegheny County

The Port Authority of Allegheny County was formed in 1956 by an act of the Pennsylvania Legislature. The Act provided that the Authority's powers would include development of marine, motor truck, railroad and air terminals with regard to transportation of coal, grain, bulk liquids, etc. In 1959, a subsequent act gave the Authority the power to acquire existing public transportation facilities and operate them as a unified system. While the Authority has not undertaken significant activities under the powers granted in the first act, it has made impressive contributions to improving public transportaqtion under powers granted in the second act.

At present, the Port Authority has two principal functions: (1) planning public transportation improvements and, (2) operation of a Transit Division (PAT). Since 1964, PAT has acquired 32 independent bus lines and has refurbished or replaced many well-worn buses. It is now in the process of replacing antiquated trolleys with new air-conditioned buses. Furthermore, PAT has developed a uniform fare structure and adjusted schedules to provide more frequent service where needed. PAT has already been assisted somewhat by state grants in carrying out its improvements (See Table C-3). Today PAT operates over 200 trolleys and more than 800 buses.

However great the accomplishments, there is still much to be done to improve mass transit in Pittsburgh. PAT is continuing its program of upgrading and expanding transit service. The financial requirements of a PennDOT in supporting the PAT program are shown in Table C-6.

Table C-6: Projects Proposed to the Bureau of Community Development (Note F) by the Port Authority of Allegheny County

Priority	Project (Note A)	1967-68 $	1968-69 $	1969-70 $	1970-71 $	1971-72 $	Total $
(1)	Over-run on Phase I of Capital Grant Program (Note B)	62,000	-	-	-	-	123,000
(2)	Purchase of 275 Buses to Replace Buses Over 12 Years Old (100 in 1968-69, 100 in 1969-70 and 75 in 1970-71) (Note C)	-	567,000	578,000	442,000	-	1,587,000
(3)	Two-Way Radio Communication System	-	83,000	100,000	-	-	183,000
(4)	Conversion of Remaining South Hills Streetcar Routes to Bus Operation (Note D):						
	Purchase of 125 Buses	-	707,000	-	-	-	707,000
	Temporary Bus Serving Facilities	-	40,000	-	-	-	40,000
	Paving Rights-of-Way and Bridges and Construction of Garage	-	-	970,000	-	-	970,000
(5)	Transit Expressway Revenue Line (Note E)	-	835,000	5,850,000	7,500,000	2,500,000	16,685,000
(6)	Purchase of Trucks and Autos	-	12,000	12,000	13,000	3,000	40,000
(7)	Purchase of 125 Additional Buses for Replacement (25 in 1970-71 and 100 in 1971-72) (Note C)	-	-	-	148,000	602,000	750,000
	Total	62,000	2,244,000	7,510,000	8,103,000	3,105,000	21,085,000

Notes:
A. Application will be made to HUD in the near future for Phase III of Capital Grant Program which will include purchase of buses for replacement and for substitution on South Hills Streetcar routes, two-way radio communication system and purchase of trucks and autos.

B. Awaiting HUD approval.

C. Buses are paid for on delivery. General Motors estimates delivery 9 months from date of order.

D. Purchase of buses and construction of temporary bus servicing facilities for substitute bus operation must be completed prior to starting paving right-of-way and bridges and construction of garages. Same buses would be used on these routes when construction is completed.

E. Preliminary estimate prepared by Westinghouse. More specific information must await completion of Technical Study which is to include preliminary engineering, economic feasability, planning and work scheduling.

F. All *costs shown represent 1/6 of the total requirements.* The Bureau of Community Development is limited to financing no more than 1/6 of construction projects.

Source: Records of the Port Authority of
Allegheny County

Currently the Port Authority is developing plans to build a Skybus rapid-transit system to serve commuters who work in downtown Pittsburgh. One route for the Skybus which is being considered would use the 10-mile Castle Shannon right-of-way which was acquired with the purchase of a trolley company. The route which the Port Authority favors would go from Bethel Park through Mt. Lebanon, Castle Shannon, Beechview, and the Wabash Tunnel, and run along the Monongahela River over the railroad bridge, under the U.S. Steel Building and the terminal at Penn Central Park. The total cost of the project could be as much as $100 million (See Table C-6).

While many seem to favor building a Skybus type of rapid transit system, some opposition has arisen to the specific route proposed by the Allegheny Port Authority. Opponents say that the line should stop at Fourth Avenue in downtown Pittsburgh, rather than extend to Penn Central Park. The estimated cost saving in stopping short of the Park would be in excess of $20 million. However, the Skybus would tie in nicely with a new office and commercial and parking complex which is to be built in the Park (See Appendix D for details under plans of the Penn Central Railroad). Opponents also maintain that running the Skybus underground across downtown Pittsburgh as a Phase II development, a second proposal by the Port Authority, would cost about $100 million more than an above-ground alternative.

In addition to the Bethel Park route mentioned above, a proposed Skybus network in Pittsburgh would be as follows:

An Ohio River line extending 6.4 miles from Midtown Plaza to the Allegheny River, where it would go underground to the North Side and then emerge to follow the Ohio River to Ben Avon. There would be stations at Market Square, Allegheny Center, Brighton Road, Marshall and Termon Avenues and in Bellevue.

An Oakland route, starting at Midtown Plaza and proceeding through Oakland and Squirrel Hill to Homewood, with stations at Dinwiddie Street, Semple, Bellefield, Murray and Braddock Avenues.

A Monroeville line extending almost 14 miles from Midtown Plaza to Monroeville with depots at 24th Street, Baum and Center, East Liberty, Homewood, Penn and Churchill.

A Mon Valley line branching out 2.6 miles from the Monroeville line east of the Homewood Station and following the PRR right-of-way into Rankin with stations at Wilkinsburg and Swissvale.

An eight-mile North Hills line shooting off from the Monroeville line east of a 24th Street station to service stations in Lawrenceville, Millvale, Reserve, West View and the North Hills.

An Etna line departing for 1.7 miles from the North Hills line between the Millvale and Reserve stations. Its only station would be at Etna.

A Carnegie line punching 2.8 miles from the South Hills line at the Banksville station to a single station in Carnegie.

An 8.9 mile County Airport line from South Hills Junction, where it runs south into Whitehall and then cuts east to the airport. Stations are at Overbrook and Whitehall Streets and Run Road and Pleasant Hills.

The estimated cost of the total network would be $500 million to $700 million.

Other rapid transit routes which have been given high priority (*The Pittsburgh Area Transportation Study, Volume 2, Forecasts and Plans,* Bureau of Public Roads, February 1963, ppl 135-151) run from downtown Pittsburgh to Swissvale. The B route considered in the study would pass by the Civic Arena and through a tunnel to Shadyside where it would surface and run past East Liberty, Homewood, Brushton, Wilkinsburg, and terminate at Swissvale. The A route would also start in downtown Pittsburgh and run through Shadyside to Swissvale. However, the A route would utilize existing Penn Central Railroad right-of-way with elevated tracks at locations where urban renewal projects are proposed. The B route was favored even though its construction costs were estimated to be considerably higher than those of Plan A. Presumably, the Plan B route would have a much higher ridership and create less unfavorable influences on communities which it would serve than would Plan A. A McKeesport extension from Swissvale was definitely ruled out for the foreseeable future (to 1980) because of the low expected ridership, high construction cost, and existing rail service between O-D's provided by the Pennsylvania Railroad.

Some factions oppose the use of Skybus and other rapid transit systems altogether and propose construction of exclusive lanes for conventional buses as the best and most economical answer to providing better commuter services. However, this alternative would aggrevate PAT's growing labor cost problems by shifting cost from capital construction to operations.

There is little doubt that something more than the existing bus service and existing roadway is needed to provide suitable transportation for outlying areas where population growth is occurring. Port Authority administrators recognize the problems associated with providing adequate public transit, given the geographic limitations imposed by rivers and steep hillsides in their area of operation. The role of PennDOT could be one of assistance to the Port Authority of Allegheny County in planning and financing public transportation improvements.

The Southwestern Pennsylvania Regional Planning Commission

The SPRPC grew out of the Pittsburgh Area Transportation Study which was completed in 1963. The Study, one of the most comprehensive urban transportation studies yet performed in the United States, laid the groundwork and outlined the development plan which still provides basic direction for SPRPC. The SPRPC is charged with the responsibility of up-dating the original development plan. Principal emphasis is on highway planning. In fact, the Pennsylvania Department of Highways relies heavily on SPRPC for direction in planning highways in Southwestern Pennsylvania. The SPRPC plan for highway development in the six-county southwestern corner of the State is reflected in the 1990 plan of the Highway Department's Bureau of Advance Planning (Figure 3-2b). The plan is basically one of building circumferential highways around Pittsburgh with appropriate "spokes in the wheels" which intersect in or near downtown Pittsburgh.

Some of the more controversial expressways in the Southwestern Pennsylvania Highway Development Plan are:

A. The Oakland Crosstown Freeway - 5.3 miles of freeway from Route 51 near Overbrook to a point on Fifth Avenue in Oakland. Presumably, this freeway would carry traffic across the Monongahela River and act as a shunt for South Hills traffic around the overloaded Liberty Tubes and Fort Pitt Tunnels.

B. The Pittsburgh-McKeesport Freeway - 13 miles of freeway beginning at the Hays end of the new Sherwood Bridge, and extending past Lincoln Place across the Monongahela River to Route 48.

C. Extension of Beaver Valley Freeway - 5 miles of freeway from Route 257 north of Beaver Falls to the Lawrence County Line.

D. Construction of an additional highway from downtown to South Hills through a tunnel which would parallel the existing Liberty Tubes. The chief controversies revolve around the disruption of neighborhoods and the high costs of building urban highways over very hilly terrain traversed by winding rivers.

The staff at SPRPC now numbers about 140 people and includes those engaged in operations research and sociology in addition to the planners. Most of the planning work done by SPRPC is accomplished with help from their operational computer model. Inputs to the model consists of data collected for the original Pittsburgh Transportation Study prior to 1963 plus detailed data collected during the past two years. The recent data which has been loaded into the model include details such as the grid coordinates of all of the gasoline stations in the Pittsburgh Area. The model is also programmed to forecast socioeconomic trends. For example, the model predicts a continuing drop in the Pittsburgh Area's manufacturing employment to 337,000 in 1970, down 6,000 from the 343,000 employed in 1960. On the brighter side, the model forecasts for the same 1960-1970 period increases of 48,000 in service employment, 26,000 in the non-manufacturing trades employment, and 20,000 in local government employment. All of these trends point toward increasing employment activity in Pittsburgh's core around the Golden Triangle where government and non-manufacturing activities are concentrated. These trends present a clearly defined need for improvement in commuter transportation to SPRPC personnel who interpret their models manipulation of data.

Other activities at SPRPC include industrial surveys to determine transportation requirements for moving freight. In recent interviews with officials of 50 shippers and 20 trucking organizations, SPRPC personnel found disparities in trucking service in Southwestern Pennsylvania. It seems that large volume shippers get outstanding service; LTL (less than truckload) shippers received very poor service. While this situation may prevail across the country for reasons of economy of scale in handling freight, SPRPC officials think that there is still room for improvement. They feel that establishment of small public transfer terminals, strategically located on highways ringing Pittsburgh could do much to improve efficiency in handling LTL orders and give small shippers much faster service. This, hopefully, would be a stimulus to diversifying the economy of Pittsburgh and promoting growth in the much needed R & D oriented manufacturing industries.

A pilot study on freight movements by SPRPC has indicated that trucks most often leave the Pittsburgh Area loaded and return empty. Conversely, rail cars most often enter the Pittsburgh Area loaded and leave empty. This is to be expected in view of the fact that Pittsburgh has a concentration of heavy industry which brings in raw materials by rail and often sends out finished products by truck. These findings were supported by FIRL's analysis of internal data on rail car movements by the Penn Central Railroad and by analysis of industrial products classifications (Tables D-1, D-2, D-3, and D-4). The SPRPC is currently following up its pilot study with a detailed study of truck movements in its six-county planning area. The follow-on study includes interviews with owners of 8,000 trucks and questions about origins, destinations and commodity flows.

Management of the Greater Pittsburgh Airport

Pittsburgh, like Philadelphia, has two major airports. The smaller, Allegheny County Airport is limited to general aviation. It is located south of Pittsburgh and is not particularly accessible from the downtown area. The second airport, Greater Pittsburgh Airport, is chiefly used for commercial flights.

The greatest controversy has resulted from indecision about how to accommodate the rapid growth of commercial aviation in the Pittsburgh Area. The controversy arises chiefly as a result of the lack of sufficient capacity at Greater Pittsburgh's terminal and parking lot. Paradoxically, the twin 10,000 foot runways at Greater Pittsburgh Airport are more than adequate to accomodate even the next generation of large jets, the Jumbo Jets. But, the existing terminals, already crowded, will be hopelessly below capacity for receiving the great surges of passengers expected (perhaps over 400 per airplane) when Jumbo Jets arrive. One suggested solution is to add wings onto the existing terminal piece-meal as demand dictates and cover the existing parking lot with extra decks. A far bolder plan proposed last year called for building a completely new and modern tunnel in the middle of the field between the existing runways. Under the second plan, the old terminal would be used for office space. Access to the new terminal would be provided by a tunnel under the field accompanied by underground parking. Proponents of the second plan say that one of its great advantages would be the lack of disruption during construction whereas add-ons to the existing terminal would actually obstruct passenger flow and reduce capacity during construction. Opponents of plan two say that the cost would be outrageously high (in the hundreds of millions of dollars——plan two shows more than 12 lanes of traffic entering the airport area) as compared to plan one.

Still another faction suggests building a new commercial airport which would be more accessible to the downtown area by rapid transit. This faction, however, is apparently very small compared to proponents of plans one and two. Actually, one link of the proposed Skybus network would connect with the terminal at the present location of Greater Pittsburgh Airport, but that link seems to have a low priority for construction.

Actually, access to the Greater Pittsburgh Airport may not be so much of a problem as it seems. Although the trip from the Golden Triangle to the airport requires perhaps a 30-minute ride on the Penn Lincoln Parkway and Airport Parkway across a river and through a bottleneck tunnel, significant numbers of people who fly regularly do not originate or terminate trips in downtown Pittsburgh or beyond. It seems that many regular airport users live in the Mt. Lebanon-Battle Hills Area which is relatively close to the airport (no data were available, however, to confirm the magnitude of its commuter problems. This is unlike Philadelphia's situation where large proportions of airport trips originate or terminate at points far distant from the airport.

The implication of the controversy and indecision about airport construction at Pittsburgh is that a PennDOT may have to sponsor a study of proposed plans and modification of plans if it should wish to finance quickly-needed passenger capacity improvement. Most likely, for most passengers, airport access is only a great problem at and near the airport parking lot, not en route to the airport. This combined with the sizable excess capacity of the existing runways tend to rule out the practicality of a search for a new location to build a new commercial airport.

ERIE

The principal organizations in the Erie Area which deal with transportation improvements are the Erie Port Commission, the Northwestern Pennsylvania Planning Association, the Erie International Airport Management and the Erie Planning Commission.

The Erie Port Commission is partially supported by payments from the General Fund of the Commonwealth ($250,000 was budgeted for the EPC in fiscal year 1966-67). The Commission is currently engaged in a desperate attempt to revitalize the Port of Erie. The decline of the Port of Erie came about rather unexpectedly in view of the fact that the much-touted St. Lawrence Seaway was supposed to have given the Port a boost. However, the switching of coal and ore loading from Erie to the new facilities at Ashtabula, Ohio, carried most of the tonnage away. Furthermore, there is some indication that rail rates from Erie to Atlantic Coast ports favor containerized international freight movements over the alternative of shipping break-bulk general cargo from the Port of Erie through the Seaway.

At any rate the Erie Port Commission is carrying out a plan to complete a new stevedoring terminal by summer of 1968. Hopefully, the new terminal will offer efficiencies which will again attract more shipments through the Port (See East Bay Area Industrial Tract, Port of Erie, Pennsylvania, U.S. Depattment of Commerce, 1966). Officials of the Commission believe that Erie's good labor relations with stevedores and the low rates will give Erie competitive advantages over larger ports.

A second aspect of the Commission's plans, the stimulation of ship building, is also in process. The Commission sold dock facilities to Litton Industries for $1,125,000. Litton is now in the process of preparing the facilities to build highly automated 1,000 foot ore carriers there. These will be the largest ore carriers on the Great Lakes.

A rather new organization, the Northwestern Pennsylvania Planning Association is reportedly developing regional transportation and land-use plans. To date, their activities have not had significant impact on developments in the northwestern corner of the state. Nevertheless, their concept of regional planning seems sound. Perhaps the Association can be of eventual assistance to a PennDOT, especially in developing access roads to recreation areas.

The Erie International Airport now provides more than 30 scheduled flights per day on three airlines. The most noteworthy recent occurrence at the Airport was the introduction of international flights to Toronto, Canada, in October of 1967. The response to the availability of connector flights with worldwide flights out of Toronto has been surprising (*Inventory and Adequacy of Existing Statewide Transportation Systems*, Pennsylvania, Wilbur Smith, 1968, pp. 4-29). There has already been a marked trend of passenger movements through Erie in preference to going through East Coast United States airports. Perhaps passengers find it easier to go through Erie's customs clearances than endure the crowds at customs offices at large East Coast airports. At any rate, the addition of international flights plus the merger of Allegheny Airlines and Lake Central Airlines could increase Erie International's appeal as a collector airport and place a strain on its small capacity.

Currently, Erie International Airport is not easily accessible from downtown Erie. The route is encumbered by many stop-light on semi-residential streets. However, this situation should be relieved by completion of planned improvements on 23rd Street, 18th Street, and 9th Street (Erie Area Transportation Study, Erie Transportation Study Committee, 1968).

The Erie City Planning Commission has participated in drawing up an Erie Area Transportation Plan. The Plan is reflected in the road network shown for the Erie Area in Figure 3-2b. One aspect of the Plan worthy of mention was its provision for parking on about 80% of the arterial streets in Erie.

HARRISBURG

The most significant plans related to transportation in the Harrisburg Area are those being made for futher development of Olmsted State Airport. The organizations involved in planning and development are reportedly the airport management, the Harrisburg Industrial Development Corporation, and the "Greater Harrisburg Movement," and Pennsylvania State University.

The Olmsted Airport was used primarily as an Air Force base for aircraft maintenance and cargo handling until it was relinquished for civilian use. In late 1967, Olmsted replaced the much smaller Harrisburg-York Airport as the commercial airport which serves the Harrisburg Area.

Actually, Harrisburg and the State received much more than an airport. It received the nucleus of a dynamic education-transportation-manufacturing complex. The airport facilities which have been donated by the Air Force include more than 1,000 acres of land, numerous buildings, a network of railroad tracks which run directly into warehouse buildings and hangars, automated cargo-handling equipment, and a 10,000 foot runway capable of accomodating Jumbo Jets. Furthermore, the existing airport terminal is located only 3 miles from the East Harrisburg turnoff of the Pennsylvania Turnpike; the airport property contains a portion of the Main Line of the Penn Central Railroad. Penn State University has received 595 acres of land in the north area of the airport along with the former administration building. Penn State has already started a Branch Campus at the airport. Enrollment is new several hundred students, even though this is only the second year of operation. Informed sources say that University officials plan to channel a major portion of Penn State's growth into its airport campus. Additionally, the Harrisburg Industrial Development Corporation is reportedly purchasing 48 acres of land adjoining the airport property.

With so much potential and so much activity already underway at Olmsted State Airport, it is evident that a comprehensive development plan should be drawn up. Such a plan is already underway.

The Airport administration is sponsoring a three-phase planning study which was initiated in early 1968. The results of the study are not yet available, but they should be of particular interest to a Penn-DOT. The unique assets of Olmsted State Airport might be especially attractive for federal demonstration projects which involve intermodal transfer of freight and passengers.

APPENDIX C-1

REGIONAL ANALYSIS OF SIGNIFICANT TRANSPORTATION ACTIVITIES IN PENNSYLVANIA

REGION 1

Region 1 is probably more desparately in need of highway construction and slower to construct than any other region in the State. The Delaware Expressway I-95 is an example of a highway which should have been constructed many years ago, but which is still far from completion. When completed in the early 1970's, the Delaware Expressway will provide the southern segment of an inner circumferential route for Philadelphia. The Delaware Expressway will be a portion of I-95 which will pass through Philadelphia connecting New York with Washington. It is now in varying stages of development in Region 1. Although completed in the City of Chester and from Bristol (Bucks County) to a point near Philadelphia, much remains to be done in acquiring the right-of-way for construction of this route. Because it will pass through the most urbanized portion of Region 1, the acquisition costs are unusally high. In addition, access interchanges along this highway will further disrupt existing urban patterns. In some situations, the design of the highway may have to be altered in order to conform to abutting planned land development, thus further increasing construction costs. Such will be the case in the waterfront area of central Philadelphia, where the Delaware Expressway will be depressed to reduce traffic noise and preserve views of the river, (See Table C-1a). Because of its proximity to the Delaware River, the sides and bottom of the road cut must be waterproofed since the roadbed will lie below river level. The "bathtub" as it is often referred to, may ultimately acquire a cover between Arch and Pine Streets. Proponents for this sunken highway, notably the Old Philadelphia Development Corporation and the Citizens Council on City Planning, have stressed the importance of retaining a view and pedestrial access to the river. This modification in highway design would also facilitate the development of Penn's Landing, a marina with pleasure boat services extending from Lombard to the vicinity of Race Street which is already under construction. Although depressing and covering this segment of the Delaware Expressway would add about $25 million to construction costs, this is considered by some to be a small investment for preserving the great charm of the historic central city, and enhancing the attractiveness of Penn's Landing and the adjacent redevelopment project areas.

A more recent factor in the design of the covered "bathtub" is the question of permitting trucks carrying hazardous materials to enter it. The State Highway Department has classified long covered depressions as a tunnel. Trucks carrying hazardous materials are forbidden to enter tunnels in Pennsylvania. However, the "Hazardous Substances Transportation Board" which can overrule the State Highway Department in such matters, has not yet proclaimed the proposed covered depressions on I-95 to be a tunnel. The question is particularly critical because many trucks carrying oil and chemicals now traverse the route of the Delaware Expressway. The trucks cannot conveniently be rerouted on existing streets. Furthermore, if a special truck by-pass is built, the costs would be great and the purpose of the $4 million cover would be defeated.

The connecting expressways with the Delaware Expressway have also presented some routing difficulties. The east-west Crosstown Expressway which would join the Delaware Expressway near Society Hill in Center City Philadelphia, has met with much opposition by interested citizens groups. The chief complaint about the proposed South Street route is that the two mile $60 million Expressway would displace many people and merchants. Estimates from such groups as the "Citizens Committee To Save the Crosstown Community" state that 6,500 people, mostly in low income groups, would be displaced by construction over the proposed route. An extensive search for alternatives for a crosstown route has concluded that the South Street route is still optimum when construction costs and population displacements are considered jointly. However, the Mayor of Philadelphia has recently suggested the abandonment of the project on the basis that the social cost in the form of neighborhood upheaval is too great when weighed against the benefits.

Region 1's answer to its problem of growth in terms of mass transportation is SEPTA, Southeastern Pennsylvania Transportation Authority, the local organization which is bolstering commuter transportation with financial aid from Federal and Commonwealth sources as well as local treasuries. The Region, nonetheless, relies on planning help from other agencies in developing programs such as open space acquisition and highway construction. The Region experiences continuing highway congestion to which the Six Year Highway Improvement Program will propose some relief (See Figure 3-2b). Among the improvements slated are three new interstate routes: I-695 (the Cobbs Creek Expressway), I-476 (the Blue Route), and I-95 (the Delaware Expressway along the waterfront from Wilmington to Bristol through Philadelphia). The proposed Cobbs Creek Expressway, (I-695) will connect the Schuylkill Expressway with the Delaware Expressway, (I-95) at a point in eastern Delaware County. Several miles below this junction, I-476 (The Blue Route) will extend northwards, traversing eastern Delaware County to intersect the Schuylkill Expressway near Conshohocken. Interstate 476 will terminate at the Northeast Turnpike Extension and provide a western bypass to Philadelphia for southbound traffic from the north. The location of this route has involved more public controversy than almost any other highway project in the Commonwealth. Though planning was initiated in the early 1950's, organized citizen reaction to initial route proposals are still delaying the determination of its general alignment. Final design work is reportedly in progress, however.

There are also improvements programmed for the highway system in the counties surrounding Philadelphia. In Delaware County, a twelve-mile segment of U.S. 322, between U. S. 1 and the City of Chester will be upgraded to a limited-access standard. Similarly, a short stretch of Pa. 352 will be improved to a four-lane highway below U.S. 1 and the outskirts of Chester. Farther to the east, an eight-mile segment of Pa. Route 320 will be improved to a four-lane highway from Pa. Route 3 to the Borough of Swarthmore.

In Chester County, the improved limited-access portion of U.S. 1 will be extended approximately six miles farther south. To the north, improved U.S. 30 at Downingtown will be extended eastward as a limited-route to connect with a relocated U.S. 202 near the King of Prussia Interchange. U.S. 202, in turn, will cross the Schuylkill River on a new bridge, bypass the business district of Norristown, and connect with the Schuylkill Expressway. Another highway link is now under consideration between U.S. 202-30 and the "Blue Route" in Delaware County which would further accentuate the King of Prussia area's function as a traffic concentration point. From King of Prussia northwestward, U.S. 422 will be improved to a four-lane limited-access highway to the new Pottstown bypass, thus providing easier access to Philadelphia from Reading and Pottstown. A spur from this new route U.S. 422 will cross the Schuylkill River to provide better access to Phoenixville. In addition, a new four-lane highway will be built on the south side of the Schuylkill River providing improved local access to the growing riverside communities in Chester County.

North of Philadelphia, a new eleven-mile limited-access improvement will be added to U.S. 309 at Lansdale to bypass Sellersville in Bucks County, thus improving access from the Allentown-Bethlehem area to Philadelphia, (See Table C-2). U.S. 611, another radial route from Philadelphia, will be improved by construction of a five-mile limited-access route around Doylestown in Bucks County. Of perhaps greatest importance to intra-regional traffic are the improvements scheduled for U.S. 202 in Bucks County. Here, over sixteen miles of new four-lane highway, with a bypass around Doylestown and a new bridge over the Delaware River at New Hope, are planned for the next six years. This might be the beginning of an outer circumferential route following the general alignment of existing U.S. 202 around Philadelphia to Wilmington. Within this outer belt, an inner loop will be formed by the combination of the "Blue Route" in Delaware County, the Pennsylvania Turnpike around the north and northwest, and the Delaware Expressway on the east and southeast sides of Philadelphia.

In the rapidly growing area between Trenton and Philadelphia, improved limited-access U.S. 1 will be extended from a point near Trenton westward to the Turnpike along new rights-of-way bypassing the densely developed areas that straddle its former route, (See Figure 3-5). Also in Bucks County, a new limited-access route paralleling old U.S. 13 will be extended from I-95, near Bristol to improved U.S. 1 at Trenton. In this same area, Pa. State Route 132 and Bristol Road will be widened to carry an increasing load of industrial and commuting traffic generated by new factories in this area.

The Pennsylvania Turnpike Commission is also considering construction possibililities for dealing with traffic problems to be created by construction of the Blue Route. The greatest problem will be the flood of additional cars to be dumped on the already crowded eastern segment of the Turnpike at Valley Forge. One solution to the problem will be to build a "Mini-Pike" from Downingtown to the New Jersey line to drain off some through traffic. This would be an alternative to widening the existing toll road. If such a pike were built, the Pennsylvania Turnpike Commission would likely have to approach the State for financial aid. Securing aid could be difficult in that funds are already in short supply for completing the Six Year Plan proposed by the State Highway Department. The total cost of the individual projects in the current Six Year Highway Improvement Program for Region 1 amounted to over $900 million, and these improvements are designed primarily to meet today's existing needs. There will be a continuing demand for expanding public road capacities in the region, (See Figures 3-2a, 3-2b, Table C-1a and C-1b).

In 1959, the Penn-Jersey Transportation Study was established by twelve governments with representation from nine counties, two states, and the Federal Government, and charged with the responsibility of determining what combination of new highways and mass transit facilities would best serve the future transportation requirements of a nine-county area in southeastern Pennsylvania and neighboring New Jersey. The Penn-Jersey Transportation Study has projected a forty-two percent increase of 460,000 additional automobiles between 1960 and 1975 in its nine-county area, and estimated that the total cost of providing adequate high facilities would range between $1.6 and 2.5 billion.

At the heart of the Region, Philadelphia provides employment for 150,000 commuters from the rest of Region 1, an additional 50,000 from the three New Jersey Counties and another 9,000 commuters from outside the metropolitan area. Significant new industrial and commercial development is occurring adjacent to important interchanges along the Pennsylvania Turnpike, particularly near King of Prussia (at the intersection with the Schuylkill Expressway in Chester County), Fort Washington (at U.S. 309 in Montgomery) and Bristol (along the Delaware River in Bucks). Upon the completion of I-95, which will parallel the north bank of the Delaware River, an even more intensive industrial espansion is likely to occur in the Bristol area. In fact, an almost continuous industrial belt already extends all the way from Wilmington to Trenton, (See Figure 3-3).

In Southeastern Bucks County the deepened 300-foot wide channel in the Delaware River provides improved access for international shipping to plants located in this area. Further up the river the old barge canal is a tourist attraction for summer barge parties. Bucks County appears to be developing more tourist attractions than any other suburban county in the Region. Such developments as Peddlers Village, a quaint shopping center near New Hope, and similar smaller developments found elsewhere in the county have drawn more and more tourists into this rural area. Barge rides on the Delaware Canal, summer fairs, plays, art exhibits, the charm of old New Hope and the many historical sites found in Bucks County provide a wide range of activities to suit the tastes of any tourist. Appreciation of the past is deep-seated in Bucks County and accounts for much of the public support given to the Delaware Valley Protective Association's campaign for retention and restoration of the Delaware Canal and opposition to the proposed four-lane high-speed expressway once planned along the Delaware River, (See Figure 3-6).

The communities of Conshohocken, Norristown, and Pottstown were developed along the Schuylkill River, which is the southeastern boundary of Montgomery County. These towns developed as independent trading and manufacturing centers. Today the Schuylkill Expressway, the Pennsylvania Turnpike and its Extension, serve as additional transportation spurs to development, and they have been influential as the county population increased 56 percent from 1950 to 1965; an increase of 200,000 persons.

The Bucks County Planning Commission has been able, by utilizing the general framework of its county comprehensive plan, and the more intensive planning knowledge it has gained by working in the Bristol area, to convince the Pennsylvania Department of Highways to modify its plans for the Burlington-Bristol Bridge in order to better conform with local plans in southern Bucks County. By contrast, the Delaware County Planning Commission is now deferring the preparation of a comprehensive county plan until such time as completion of a regional urban transportation plan has provided answers to the all-important issue of highway and rapid transit location. Because the greatest number of Philadelphia's commuters come from Delaware County, and since almost all of the county is covered by the regional study, the transportation study findings will be more crucial for future planning in Delaware than in any other suburban county.

To summarize, an interdependency exists between Region 1 and areas on its periphery. Though Philadelphia is an employment center for a substantial number of commuters through-out the area, significant interactions also exists between Bucks and Mercer (New Jersey) Counties, and between the counties of Delaware (Pennsylvania) and New Castle (Delaware). The implication is that a PennDOT administration will have to maintain good working relationships with its counterparts in New Jersey and Delaware in order to meet rapidly growing transportation demands for interstate travel by residents of the greater Philadelphia area.

REGION 2

Region 2 is on the outer periphery of Megalopolis with an orientation towards Philadelphia as well as New York and Harrisburg along the Great Valley route south of the Blue Mountain ridge line. I-78 is a major transportation route carrying more inter-regional traffic than any other highway in Region 2. Since this highway runs very close to the northern boundary of the growing urban area of Allentown, Bethlehem, and Easton, they have become linked with all parts of the United States. A second major facility, the Northeast Extension of the Pennsylvania Turnpike, intersects U.S. 78 only a few miles west of Allentown and connects the Region with Philadelphia to the south and Scranton and I-81 to Binghamton and Syracuse in New York to the north. Already this portion of Region 2 has the beginnings of a good inter-regional highway system with these northeast-southwest and north-south limited access highways. The population center of Berks County, Reading, is not as fortunate as it is located some distance from the major inter-regional highways, I-78 and Pennsylvania Turnpike. A new four-lane limited-access highway I-76 connects Reading with the Turnpike and cuts travel time to Philadelphia by at least 15 minutes. By contrast, Reading's northern U.S. Route 61 connecting the city with I-78 remains a crowded four-lane divided highway.

The interchange of U.S. Route 61 and I-78 has created surges of traffic in Leesport, because U.S. Route 61 must now pass through Leesport enroute to I-78. A by-pass around that borough has been proposed. Even with such improvements, the capacity of this highway may continue to decline. Because U.S. Route 61 is not a limited-access highway, strip commercial development is occurring along both sides all the way from Reading to I-78 resulting in increased turning movements onto and off of the highway.

Of highest priority are proposals for improving U.S. Route 222 from Lancaster to Reading, circling north of the City to connect with old U.S. Route 222 which would be similarly upgraded all the way east to Allentown, (See Table C-2). Other plans call for a new U.S. 422

starting at Womelsdorf, by-passing Robesonia and Wernersville to the north, and passing through some of the richest farm land areas in the County to connect with the Tulpehocken River route through Reading to old 422 beyond. A parallel route to 422 on the south side of the Schuylkill River has been proposed to relieve traffic congestion on 422, and a new route to Boyertown has been suggested which would provide better access between that growing area and Reading. Berks County officials believe all four of these proposed highways are important although only the first two of them are shown on the Second Six Year Highway Improvement Program, (See Table C-1a).

In Lehigh and Northampton Counties, the traffic volume on I-78 is already high. The Second Six Year Highway Program proposes that I-78 would be relocated to cross over a new Delaware River Bridge south of Easton into New Jersey. This route would interchange with a new U.S. Route 611 sout-west of Easton. Two east-west and two north-south routes forming a grid around this growing urban area will give it good access to markets in all directions. The tentative 25 year local highway plan contemplates a "cement route" paralleling U.S. Route 22 to the north and connecting Tatamy on new U.S. Route 611 to Schnecksville on the Northeast Extension and providing better access to the cement mining areas of the County. A new scenic route, "The Blue Mountain Parkway", is also proposed. This would lie along the south slope of Blue Mountain, extending from the Delaware River, near Portland, west across Northampton, Lehigh and Berks Counties, (See Figure 3-2b). Within the shorter range, the Governor's Six Year Highway Improvement Program proposed two major facilities: The relocation of existing U.S. Route 115 from its connection with Pa. Route 512 near Wind Gap, south to U.S. Route 22 west of Easton, and the gradual improvement of U.S. Route 309 from Allentown, northwest to Tamaqua in Schuylkill County, (See Figures 3-2a and 3-2b, and Table C-1a).

It is no accident that Region 2 is well advanced in its long range highway planning. Due to the efforts of the three county planning commissions, the planning commissions of the four large cities of the Region and the Highway Department's Bureau of Advance Planning, greater local understanding of the need for and the proper location of new highways in Region 2 has been achieved. In Berks County, a part of the Liquid Fuels Tax Fund is used to pay part of the land acquisition costs for State highways. Even though this type of contribution may not have given Berks County a higher priority, it has speeded up its highway development program as well as lowering the land acquisition costs.

If we were to look back at Pennsylvania several centuries from now, we would probably label the period we are now in as the State highway building period. Region 2 is no exception to this. Already Reading has a new limited access highway connecting its central business district on the west side of the Schuylkill River with the Pennsylvania Turnpike. Similarly, limited access routes are being planned for the Allentown-Bethlehem urban complex which will connect the core of these communities with the Interstate System, (See Table C-2). In Easton, existing I-78 delineates the northern boundary of that community providing immediate access to Easton's downtown area.

With these new highways, one may be able to drive to the center of the City in a short period of time. But will this in turn create traffic congestion in Region 2's central business districts or place undue strain on its limited central city parking facilities? In an effort to plan a workable urban highway system, the four cities in the Region are now working with the State Highway Department on Transportation Studies: collecting and analyzing data, and planning and testing alternative highway solutions. In addition, each of the four cities in the Region is in the process of making community renewal plans which include studies of downtown automobile access, parking and public transportation facilities.

The large amount of land required for these limited-access highways and interchanges inevitably remove a significant quantity of property from each city's tax base. The expectation is that this loss will be more than counterbalanced by renewed commercial development as central business districts gain easier metropolitan access. In reality, each new freeway and its suburban interchanges also present the alternative potential of commercial dispersal of central city economic functions. Considering the tremendous impact the detailed decisions on highway and interchange location will have on the future form of these urban communities, it is indeed fortunate that the county and regional planners, with their well defined objectives of maintaining a strong urban core, are as closely associated with the State Highway Department as they now are in the cooperative effort to plan the Region's future urban transportation system.

These new regional highways will also permit a greater number of residents in Monroe, Carbon and Schuylkill Counties to commute to work in Region 2, where good labor is becoming scarce, and further enhance the economic interdependence of communities within the Region.

The future development of industrial sites will undoubtedly take place at the focus of the highway system near the existing urban areas especially in the Allentown-Bethlehem area. In contrast, the proposed Blue Mountain Route would draw tourist related activities into the northern part of the Region and the improvement to U.S. Route 115 would facilitate access from the Region to the Poconos and the nearby Tocks Island National Recreation Area, (See Figure 3-6).

REGION 3

Location of this Region on the upper periphery of the State has resulted in isolation and inaccessibility. The major route which passes through the area is U.S. Route 611 which crosses central Monroe County and is the main artery connecting Scranton with the metropolitan areas to the south and east. Two other Routes, U.S. 6 and 209, function mainly as internal distributors for the Pocono tourist trade.

Up to the present, new road construction has centered about providing a by-pass around the Stroudsburg urban complex. A portion of I-80, the Keystone Shortway, has been completed and has provided traffic a by-pass around the congestion at the Delaware River and in the environs of Stroudsburg. This highway will provide a direct east-west route across the central part of the State and tie in with other sections of the Interstate System in Pennsylvania.

I-81 E, paralleling U.S. 611, will eventually connect Scranton with I-80 and to complete the Region's interstate network will be I-84 which enters the State at Matamoras and crosses central Pike and the southern tip of Wayne. I-80 and 84 will provide access to both ends of the huge Tocks Island Recreation Area.

U.S. Route 209, winding along the Delaware from Stroudsburg to Matamoras will have to be relocated when the reservoir is created. The new route will be the main access road to the Pennsylvania side of the Tocks Island Area and will play a major role in determining the extent and character of development which is permitted along its route.

Interest in recreation and scenic highways has spurred efforts to revive the 25 year old Pocono Mountains Memorial Parkway idea. Original proposals called for a low speed, two lane parkway (similar in concept to the Blue Ridge Parkway) running from Monroe County to the vicinity of Milford, along the high ridges overlooking the Delaware Valley well back from existing U.S. Route 209. The purpose of this scenic highway would be to serve as a tourist attraction in the Pocono Highlands rather than as an access route for Tocks Island.

Monroe County will be easily accessible to tourists from urban centers in New York, New Jersey, and eastern Pennsylvania upon completion of I-80, 81E, and 84. Pa. Route 115 and U.S. Routes 209 and 611 also serve the area. Monroe has no air facilities of its own and only at East Stroudsburg is there a rail link to New York City and Philadelphia.

Penetration of two Interstate Highways into the Pocono region will have immeasurable impact on its economy and development and will open the gates to the millions of people living only a few hours away. The magnitude of this influx will necessitate a substantial increase in motels, restaurants and recreational facilities. The greatest and most immediate pressures will come in Monroe and Pike and in the southern tip of Wayne County around Lake Wallenpaupack where I-84 crosses.

The proposed interchanges will become the nodes of development. Monroe alone will have 16 interchanges each a potential commercial or industrial site. The most strategic of these will be at the intersection of the two Interstates in western Monroe. I-84 will provide five interchanges in Pike and one in Wayne.

Proper design and access control of the existing and proposed highways can prove to be the most effective planning tool available to the State and local communities alike.

Roadside blight can be greatly reduced under present State-Federal regulations which can exclude billboards from the rights-of-way of the new Interstate Highways. However, only the local municipalities can control the area outside of the right-of-way.

U.S. Route 209, which will be the main service artery to Tocks Island, will be the most powerful planning tool for that area. Its location with regard to the recreation area and access points will determine whether tourist facilities are "clustered" or strung out along the route as is currently the case. Present plans for the interchange of this route and I-84 will pose a serious threat to Milford's continued existance. Funneling traffic through the town center may well obliterate its unique charm.

The combination of good highways and recreational attraction may prove to be a strong magnet to industry. Indiscriminate selection however, incompatible with the recreational industry, would not be to the best advantage of the areas, (See Figures 3-5 and 3-6).

To meet the challenge and opportunities of existing and potential assets of this Region will require close cooperation and coordination of State, Federal and County agencies.

1. *Highways Serving Pike County.* The eastern portion of Pike County would be best served by a new highway leading towards Monroe County, I-81E and I-80 which would extend from Dingmans Ferry to Porters Lake then dip southwest to connect with the Pocono resort areas and I-81E. (A large part of this suggested route parallels the proposed Pocono Memorial Parkway.)

The second proposed arterial is a U.S. Route 209 by-pass around the Strodusburg area. Traffic to and from Scranton and points west and particularly from Philadelphia and points south enroute to the Delaware Water Gap National Recreation Area would therefore avoid I-80 through the Stroudsburg area.

The eastern destinations of both the inner loop highways (Dingmans Ferry and Bushkill) are the sites of the largest recreation facilities in the Pennsylvania portion of the Delaware Water Gap National Recreation Area, (See Figure 3-6). In addition to serving regional traffic movements, these inner loop roads would open up some presently inaccessible areas of Pike and Monroe Counties and facilitate intra-county travel.

2. *I-84 Interchanges.* Five interchanges of I-84 are now planned in Pike County. The interchange between Matamoras and Milford is of critical importance, as is the interchange west of Milford. The remaining three interchanges are grouped somewhat close together in the western portion of Pike County where development is limited by extensive State land holdings. It is recommended that additional investigation of the interchange points be made and that consideration be given to an interchange at Lords Valley.

3. *Route 209-Route 423 Connections.* Adjacent to the DWGNRA, Route 209 will act as a link between I-84 and I-80. A similar connection should be studied for the western portion of the two-county area. U.S. Route 423 presently runs from the southern end of Lake Wallenpaupack to Route 611 near Tobyhanna and could become the final link in creating a loop system of super-highways around most of the two-county sector.

4. *Connections to Lehigh County and Northampton County.* The Joint Planning Commission of Lehigh-Northampton Counties has recently published a report containing several recommendations pertinent to the Tocks Island region.

(a) Relocation of U.S. 611 as a vital connecting link from the south to I-80, will eventually provide a major corridor for traffic from the Philadelphia and Allentown-Bethlehem-Easton metropolitan areas.

(b) Construction of a Slate Belt Expressway to significantly improve traffic movements in this portion of Northampton County and provide improved access between Wind Gap and Portland, facilitate travel to the National Recreation Area and I-80, and eventually provide an alternative to I-80 through the Water Gap.

REGION 4

The Bradford County Planning Commission made a comprehensive transportation study in 1963 for the County. This study recommends by-passes around the growing Waverly-Athens-Sayre and Towanda urban areas and proposed that overburdened highways be widened elsewhere in the County, (See Table C-1a). The remaining counties in Region 4, Sullivan, Susquehanna, Tioga and Wyoming have not been able to substantiate local recommendations for State highways improvements requested by the State Highway Department.

Even with such back-up material, Sullivan County has been quite outspoken in presenting its case for an improved U.S. Route 220 from the Williamsport area to Towanda and for additional improvements to Pa. Route 87 from Dushore to Mehoopany. Tioga County has also been active in promoting improvements to U.S. Route 15 north from Williamsport to the State line. Recently the Williamsport Chamber of Commerce went on record recommending improvement of U.S. Route 220 from the Maryland State line only as far as Williamsport with the improvement of U.S. Route 15 north from Williamsport to the New York State line. This action created some disappointment among Sullivan and Bradford County development groups who empahsize that since each route performs a different function, both should be improved.

The advantages of improving U.S. Route 15 concern highway system planning and tourist development. Together with existing I-83 (starting in Baltimore) an improved U.S. Route 15 would provide a continuous north-south facility all along the rapidly growing Susquehanna Valley to the Pennsylvania State line, from which point New York already plans a four-lane, limited-access improvement north to Rochester and the New York Throughway. U.S. Route 15 currently serves greater traffic volumes in Region 4 than does U.S. Route 220, and its improvement would increase both State and out-of-state access to the many existing and proposed recreation and tourist attractions of Tioga County.

The virtues of U.S. Route 220 improvement are more narrowly conceived in terms of economic development and manufacturing employment in Region 4 Unlike U.S. Route 15, U.S. Route 220 would intersect New York Route 17 in the heart of the Binghamton-Elmira industrial complex to which so many residents of Region 4 already commute. It is at this intersection (where the new limited-access U.S. Route 17 dips down into Pennsylvania for a short distance) that the South Waverly - Sayre - Athens urban complex presents Region 4 with its only significant growth center, its largest manufacturing employment center, and its only large industrial park with realisti prospects for future development, (See Figure 3-5). Route 220 would also provide improved access to the tourist and vacation homes development of Sullivan County, (See Figure 3-6).

In impartial recognition of the virtues of each of these routes, Pennsylvania recommended that both be considered as additions to the proposed Appalachia Development Highway System, (See Figure 3-2b). No less impartially, (any increase in Pennsylvania's allotment would require a cutback in some other state) the Appalachian Commission has rejected both proposals. This may seem a setback for Region 4, but the Pennsylvania Highway Improvement Program has scheduled limited improvements to both routes from its normal operating budgets.

Engineering designs for a new limited-access U.S. Route 220 highway right-of-way running from U.S. Route 17 south around Sayre and Athens were approved at a public hearing held in South Waverly. Concurrently, State Highway studies have been undertaken for the continuation of this route south to by-pass Towanda and connect with U.S. 6 over a new Susquehanna River bridge at this point. Construction of the first segment of this route and the Towanda by-pass will probably take place within the next three or four years and the second intervening segment within the next ten years. Starting from Williamsport, U.S. Route 15's improvement is scheduled to be extended northward for 20 miles during the next six years.

Of great importance to the northern tier of Pennsylvania is U.S. Route 6 which extends through three of the counties of Region 4 on an east-west axis. This route, intersecting major U.S. north-south routes at Mansfield, Towanda and Tunkhannock, has provided the only east-west access to this sparsely developed Region. As a result, the towns which have grown up around the intersections of these primary highways have begun to experience local traffic congestion. For this reason, and for the purpose of opening up around the intersections of these primary highways have begun to experience local traffic congestion. For this reason, and for the purpose of opening up the scenic northern tier of counties to greater tourist traffic, local efforts have been directed towards promoting the improvement of this highway. As a consequence, short segments of U.S. Route 6 have already been rebuilt, realigning the old route and adding third lanes on the hills to provide a passing lane for faster moving traffic in Wyoming County. Similar improvements have also been made and are planned for on other segments of U.S. Route 6 across the State, (See Figure 3-2b).

Perhaps the greatest potential of U.S. 6 lies in that segment running southeast from Towanda to Scranton. If upgraded to high-speed, limited access standards, this highway, together with the similar improvement of U.S. Route 220 between Towanda and U.S. Route 17 could provide a significant shortcut to traffic traveling between the New York State and northern Pennsylvania. The provision of such a high volume facility in an area of outstanding scenic beauty does involve certain design problems, but the Pennsylvania Highways Department has already demonstrated its capacity to meet this challenge in the design of U.S. Route 322 along the Juniata River and I-81 in Susquehanna County.

With an increased flow of tourist and commercial traffic through Pennsylvania will come the opportunity of developing tourist attractions more intensively along U.S. Route 6. It will also provide the opportunity of drawing branch plants of factories already established along New York Route 17 into Pennsylvania closer to their large eastern urban markets and the residence of a significant proportion of their labor supply. Already plans are being made in the Sayre-Athens area to centralize on this trend by planning to develop a 1,000 acre industrial park nearby. At present, negotiations are underway with the State Highways Department to provide a new bridge across the Chemung River from the proposed limited-access by-pass to the proposed industrial park.

REGION 5

Since the Interstate program has criss-crossed Region 5 with four major limited-access highway routes, already several segments of this highway system have been completed. I-81 now is used between Binghamton, New York and Scranton, and will eventually link the growing Montreal urban area with the entire southern United States. The next section of this route is now under construction between Scranton and Hazleton, providing another link between these cities and east-west I-80, the Pennsylvania Shortway. When completed I-81 will provide excellent connections between most of the Region's cities and Harrisburg.

I-80, on the other hand, will place Region 5 astride the shortest, most direct highway route between the growing mid and far western areas of the United States and New York on the east coast. I-84 will originate in the Scranton area and pass eastward through the Poconos and the State of New York into New England. I-81E will parallel U.S. Route 611 from Scranton to I-80 where it will terminate northwest of Stroudsburg. All of these limited access high speed routes will place highway users in the Region within two or three hours driving time from Philadelphia and New York.

Though all of the Region will benefit from the new Interstate system, some parts of Region 5 will benefit more than others. On completion of the system, the greatest concentration of limited access highways will be found in the Scranton area where I-81 and the Northeast Extension of the Turnpike will combine to form a circumferential loop around the City. These highways, plus I-81E and 84, form a radial pattern of expressways connecting Scranton with the major areas of the United States, (See Figure 3-2a and 3-2b). In another part of the Region, the six or seven miles which will separate I-81 from Pottsville, Schuylkill County Planning Commission proposes that existing Pa. Route 61 connecting Pottsville with I-81 be straightened and widened. They also have proposed that crowded U.S. Routes 309 and 209 be widened, (See Table C-1a). Pa. Route 61 south of Pottsville, utilized by workers commuting to jobs in Lehigh Valley, is also overcrowded and the county planning commission has called for widening this route as well.

In Luzerne County, a cross-valley route connecting U.S. Routes 11 and 309 with I-81 with a bridge over the Susquehanna River will tie east and west shore developments in this part of the Region closer together. Luzerne County highway improvement proposals advocate additional State expenditures for connecting routes between I-81 and the Wyoming-Lackawanna Valley strip city running from Nanticoke to Scranton. Similarly, the Luzerne County Planning Commission proposes additional primary highways in the Hazleton area to provide better access into that City while city officials in Scranton (Lackawanna County) call for a state-federal financed inner loop connecting the Turnpike with I-81. Most of the above proposals have been included in the Governor's Six Year Highway Improvement Program, (See Figure 3-2a, 3-2b, Tables C-1a and C-1b).

One of the Region's major assets is its proximity to large urban markets. I-80, 81, 81E, 84 and the Northern Extension of the Pennsylvania turnpike link the area to most economic centers in Northeastern States. Air passenger and cargo services is provided by four major airlines operating from Wilkes-Barre - Scranton airports. Although rail facilities have been abandoned since coal consumption has declined, several railroads provide an adequate freight service to the Northeast and Midwest, (See Table B-2 and Figure 1-1).

Though the State Highway Department can set priorities for highway improvements (based on projected past traffic demands and estimated building costs), their forecast of future traffic demand depends upon the quality of information they receive about local long term development objectives. As a step in this direction, the county planning commissions in each of the four counties in this Region were invited to submit highway proposals to the Department of Highway's Bureau of Advance Planning. These submissions have in effect been the best calculated guesses that could be made under the level of planning reached in each of the respective counties. If the counties in Region 5 wish to maximize the potential advantages of this form of intergovernmental coordination, they will have to complete and keep their land use development plans up-to-date and develop more expertise in local highway planning.

As a step towards closer state-local cooperation, State Highway and local planning technicians in the Scranton-Wilkes-Barre area are gathering highway and land use data that will be used to develop a continuing urban transportation planning program.

Each city has sought better highway access to their central business districts and future highway development will undoubtedly open up these districts to greater vehicular traffic. The urban transportation study for the Wilkes-Barre-Scranton urban area will go a long way towards coordinating inter-city as well as state-local activities in this area. The best long term hope may lie in the development of comprehensive metropolitan plans for the major cities of the Region. Furthermore, plans must now be made at the metropolitan level to provide for an orderly transition from a tight knit central city of the past to the more dispersed city form which will become inevitable with the completion of the many new highway facilities.

REGION 6

Construction of I-78, 81, and 83, together with the existing Pennsylvania Turnpike provide an exceptionally good interregional and interstate highway network linking Region 6 with Philadelphia, Allentown-Bethlehem, Scranton and Wilkes-Barre, Pittsburgh and the West, Baltimore, Washington and points South. These new facilities also establish an expensive standard of emulation in planning the future upgrading of such internal State primary roads as U.S. Routes 11, 15, 22, 30, 72, 22, 230, and 422--each of which is deemed vital to the development of one or more counties within the Region.

It is perhaps inevitable that any program which has as great an effect on the future pattern of regional development should be highly controversial. The areas of conflict may be summarized as follows:

1. Two of the Region's four central cities (Lebanon and Lancaster) have been left off the Interstate System entirely. The Highways Department plans to correct this by extending I-81 south past Lebanon to the Turnpike and by upgrading Lancaster's U.S. Routes 30, 230, and 222 to Interstate standards.

2. Too little effort has been devoted to providing quicker access to the cities' central business districts. Harrisburg has such a facility in U.S. Route 83 but criticizes its lack of acceleration and deceleration lanes at interchange points. York, which has lacked downtown access from U.S. Route 83 will soon be provided with a northern spur to fill this need. Better access to Lebanon and Lancaster's central areas has yet to be resolved, (See Table C-2).

3. Outside the cities, there has been considerable criticism of the new highway's extravagant use of the Region's most fertile farmlands. I-81 cuts through Franklin County's best limestone soils and might, considering the county's farm interests, have better been located west of U.S. Route 11. The same situation pertains in Lebanon County where a new right-of-way south of existing U.S. Route 422 would not only disrupt some of the State's most productive farms, but also attract urban development into an area in which septic tank pollution of ground water is a major hazard. At the request of the Lebanon County Planning Commission, the Highway Department is presently evaluating an alternative route north of U.S. Route 422 which, while more expensive, would be less disruptive.

4. In another parallel dispute concerning the location of new Route 30 between York and Wrightsville, the Highways Department has reasoned that a central Hellam Valley route would disrupt fewer farm properties, while the York County Planning Commission urged a side-of-the-valley

location. The latter proposal was supported as permitting a more orderly pattern of future urban growth and proving a more esthetically pleasing solution to the highway's location. This latter charge of indifference to the scenic qualities of location is a familiar criticism of the Highways Department which the appearance of new U.S. Route 322 between Amity Hall and Newport along the Juniata River should do much to refute. James C. Whalen, the engineer in charge of U.S. Route 322, had previously been responsible for the design of that section of I-81 between Scranton and Binghamton which has won the Parade Magazine National Award as the most beautiful road of the year.

5. The large backlog of highway improvement proposals has inevitably generated a certain amount of controversy over which projects should come first. The Highways Department's Bureau of Economic Research and Programming has recently perfected the technique of measuring "sufficiency rating by investment opportunity" which should allow much greater objectivity in priority assignments. The greatest contribution the County Planning Commissions could make is not in "second guessing" the Highways Department's assessment of current needs, but rather in identifying in their county plans the location of those future land use activities which will most influence future traffic patterns.

6. Part of the problem of providing Region 6 with an up-to-date primary network stems from the fact the Highways Department, saddled with legislative responsibility for over 42,500 miles of State highways, has been quite unable to give appropriate financial priority to the 12,000 miles of State primary routes. Under these circumstances, the Highways Department is forced to seek economy measures such as solving the needs for interregional and local traffic with a simple facility. In the case of the northern York by-pass combination of high-speed, limited-access, grade separation U.S. Route 30 with a medium-speed, multiple access, local distributor route, the better solution might well be two separate roads rather than one, (See Table C-1a). So far, almost all utility expansions and highway improvements have involved attempts to catch up with prior demand rather than direct the location of future development, (See Figure 3-1a and Table C-1b). Much of the local controversy over State highways has concerned the priority needs for upgrading existing facilities--a subject that the State Highways Department is now fully prepared to evaluate on an objective basis. It is only the county planners who can identify the county's long-term development objectives and how specific highway proposals would affect such plans.

In general there is good access to the North, South and West but improvements are needed on the internal State primary roads, U.S. Route 11, 15, 22, 30, 72, 222, 230, and 422, (See Figure 3-2a and 3-2b). Two of the Region's four central cities, Lebanon and Lancaster have been left off the Interstate System completely. There is a definite need of better access to the cities' central district, at the same time considering whether the right of way should pass through some of the best farm land. There has been a general abandonment of city residents by the Region's upper and middle income classes as a serious dilution of the economic base. All central cities have lost some of their manufacturing employment.

REGION 7

The major highway routes found in Region 7 follow the Juniata and Susquehanna Rivers that cut through the mountain and provide access to this rugged portion of Pennsylvania. Under the Six Year Highway Improvement Program, adopted by the State Highways Commission in July of 1965, it is proposed that the Juniata River, U.S. Route 322-22 access highway, already complete from Amity Hall to Newport, and under construction from there to Millerstown, be extended to Lewistown. From Lewistown, U.S. Route 22 will be improved all the way to the Pittsburgh Metropolitan Area with Federal Appalachian funds. This new east-west highway should be a tremendous help in ending the isolation of south-central Pennsylvania and a particular advantage to Juniata and Mifflin Counties in Region 7. Better access to the Shortway from Harrisburg would also be made possible by extending existing improvements to U.S. Route 322 from the Lewistown by-pass to the State College and Bellefonte area of Centre County. A new section of this highway is already being proposed in the Seven Mountain area around the new Lewistown Borough water reservoir which would eliminate several of the sharp curves found here.

Additional improvements in the Six Year Improvement Program include: by-passes around such urban centers in Region 7, as: Selinsgrove, Sunbury, Danville and Berwick; a 3.2 mile, four-lane divided highway, which would extend the improvement of U.S. Route 15 from West Milton, south to Lewisburg; and a four-lane 15 mile divided highway connection between U.S. Route 220 in Lycoming County and the Shortway near Milton, (See Figure 3-2b). The latter route is part of the Appalachia Development Highway proposal for improvement of U.S. 220 all the way from the Maryland State line in Bedford County, north around Lock Haven and Williamsport to the Shortway in Northumberland County. Unfortunately, later Appalachian proposals to extend this route south through Sunbury and the anthracite communities of Shamokin and Mount Carmel, to link these with the Anthracite Expressway (I-81) in Schuylkill County, have been rejected for inclusion in the initial phase of the Appalachia Development Program. At the present time, poor roads in this area, coupled with rough terrain, make this hard coal belt fairly inaccessible to both local inhabitants willing to commute out of the area and new industries wishing to move in.

The Keystone Shortway in the northern part of the Region will pass through the area of most rapid population growth in the Region, (See Figure 3-5). With two interchanges in Northumberland, one in Montour, and four in Columbia County, the form of future urban development will be changed from today's characteristic strip development along U.S. Route 11 towards a more concentrated cluster around each interchange. To guide development in the vicinity of these interchanges, Columbia and Montour County Planning Commissions are now preparing zoning ordinances to be submitted to their respective County Board of Commissioners for public hearing and adoption. Though Northumberland County has a planning commission, it is not making any plans at the present time for controlling development of the two Shortway Interchanges which are located in this county.

It is particularly important in this mountainous region that level sites at these interchanges be reserved for future commercial and industrial use. Zoning is one method of retaining such land. However, at the critical U.S. Route 11 interchange with the Keystone Shortway in Columbia County, such land use controls have come too late. At this interchange, the contractor building this segment of the Keystone Shortway has destroyed the development potential of the adjoining 40 acres of level land by using this site as a 30 foot-deep borrow pit source for highway fill.

While the strict access control features of I-80 (the Keystone Shortway) will encourage concentrated urban development at a limited number of interchanges along the West Branch of the Susquehanna, the absence of such controls along Route 15 has already caused a proliferation of roadside commercial development all along the west bank of the river in Union and Snyder Counties. Though Route 15 is being improved to a limited-access highway between White Deer and West Milton (which it nearly cuts in half), the rest of the route permits unlimited access to all abutting land owners. The loss of highway efficiency which multiple access can induce is best illustrated by the history of an earlier improvement to U.S. Route 15 between Selinsgrove and Shamokin Dam Boroughs. At first, this unlimited-access highway consisted of three lanes with a 50 mile an hour speed limit. As strip commercial development spread along both sides of this highway, a new lane was added, but the increasing traffic hazards of turning movements soon forced a reduction in the speed limit to 40 miles an hour. The more recent extension of this segment of Route 15 improvement, a new four-lane divided highway between Shamokin Dam Borough and Lewistown, also incorporates this feature of unlimited access. Already, junk yards, gasoline stations, industrial, general, commercial, and residential uses are springing up on both sides of the highway, and sometimes between the two lanes where the wide median strip has remained in private ownership.

It is difficult to reconcile the scenic beauty which is associated with U.S. Route 322-22 along the Juniata River with the ugliness and traffic handling inefficiency which has been designed into U.S. Route 15 along the Susquehanna, or understand why the sympathetic, harmonious conjunction of town and highway achieved at Liverpool could not have been repeated at West Milton.

Undoubtedly, a part of the problem has always been the pressure exerted on the highway builders to scatter highway improvements all over the State. This has resulted in the piece-meal highway planning which has proved so unfortunate in Union and Snyder Counties. The Six Year Improvement Program recently initiated by the State Highway Commission will permit highway systems to be planned and programmed for development over longer periods of time. This should result in better highway design and more attention to access control. With the guidance of the Highway Department's Bureau of Advance Planning, highway design has begun to broaden beyond matters of engineering to include economic analysis, scenic preservation, regional development, and urban design. However, comprehensive design work cannot be conducted without some local forethought in the form of regional and county plans. The lack of such local planning is one of the most serious deficiencies in Region 7.

Most of the larger urban centers which have grown up along the major Susquehanna and Juniata Rivers transportation routes are today declining in size due to the decline of population to the suburbs. While this is true for the larger boroughs and cities in Region 7, the smaller boroughs have continued to grow mainly because they still retain some vacant land. One experience which many of these communities share with larger cities is that of traffic congestion on Main Street. There is a need to divert some of today's regional traffic around the downtown areas, while at the same time making each of these communities more accessible to its own regional rural market. In Lewistown, the new U.S. Route 22 will cut through the southern limits of the Borough, providing better regional access to the largest single employer in the area, (The American Viscose Plant) and creating opportunities for additional motel development. In Selinsgrove Borough, U.S. Route 15 by-pass will take heavy traffic off of the main business street. By-passes around Milton (U.S. 147), Sunbury (connecting Routes U.S. 147 and 61), and Berwick (U.S. 11) will perform similar functions, (See Table C-1a and C-1b). While construction work continues on the Shortway, intersecting north-south U.S. Route 15 is being upgraded to a limited-access facility in northern Union County and coupled with the new unlimited-access route between Harrisburg and Williamsport. Although Montour and Northumberland Counties have County Redevelopment authorities, only the former has acquired a staff, consisting of an Executive Director and a part-time Secretary. Because the authority existed many years without a staff, it is only now reaching the execution stage of its first project. This project is located in the Borough of Danville and consists of 33 acres of dilapidated housing. Present plans call for the redevelopment of this site for commercial use, off-street parking, and some residential uses. The project will include the coordinated relocation of Mahoning Creek, re-routing of Pa. Route 54, and providing for a park strip between the highway and the new river bed in the Danville Borough.

Though none of the urban centers of Region 7 have over a 14,000 population, one experience many of them share with larger cities is that of traffic congestion on Main Street and the need to divert some of today's regional traffic around the downtown area, while at the same time making each of these communities more accessible to its own regional rural market.

REGION 8

Because the valleys in Region 8 are oriented in a northeast-southwest direction, development has occurred in that direction as well. Not surprisingly, urban and industrial growth has taken place along this same corridor which, with the exception of State College, is served largely by U.S. Route 220 which passes through the center of Region 8, linking Lock Haven and Williamsport with Altoona to the southwest and with the Binghamton-Elmira, New York State urban complex to the northeast beyond mountainous Sullivan County.

However, east-west and north-south access to this Region has been difficult, due to the Allegheny Plateau escarpment to the west and north and Bald Eagle Mountain to the south. Nevertheless, cross links with the transportation spine do occur in the southern part of the Region where U.S. Route 322 climbs the face of Bald Eagle Mountain to the plateau beyond State College, to descend via Lewistown and the Juniata and Susquehanna River Valleys to Harrisburg. To the west, U.S. 322 traverses the rugged topography of the Allegheny Plateau between Port Matilda and Philipsburg. In the central portion of the Region, U.S. Route 120 branches off from U.S. Route 220 at Lock Haven and follows the meanders of the upper West Branch of the Susquehanna, providing somewhat tenuous access to the wilds of central Pennsylvania around Renovo. At the northern part of this transportation spine, U.S. Route 15 from Harrisburg must climb over Bald Eagle Mountain, south of Williamsport and cross busy U.S. 220 in downtown Williamsport before proceeding northward through the mountains to distant Rochester and the New York Thruway. Of all these routes, only U.S. 220 and the parallel U.S. Route 64 through State College are free of steep mountain gradients.

Partially alleviating a need for better east-west roads, the Keystone Shortway route will traverse the rough terrain of northern Centre County near Bellefonte, pass approximately eight miles south of Lock Haven and eighteen miles south of Williamsport. Between the Shortway and the latter two cities stand Bald Eagle Mountain. Access from the Shortway is limited to the gap at Mill Hall for Lock Haven and U.S. Route 15 over Bald Eagle Mountain into Williamsport. Even though the Keystone Shortway does not provide easy access to the major urban centers, it will provide superb access between Region 8 and the Midwest and Atlantic Seaboard when completed.

In Lycoming County, two major improvements are proposed by local interests: a limited-access beltway, relocation of U.S. Route 220 north of Williamsport, and an improved U.S. Route 15 north of Williamsport to the New York border. Though not opposing improvements to existing U.S. Route 220 northeast through Sullivan and Bradford to the Elmira-Binghamton area, the Williamsport Chamber of Commerce has gone on record in favoring the U.S. Route 15 links with Rochester as more beneficial to this City. The State had proposed the inclusion of both routes in the Appalachia Regional Development Program, and both have been rejected for the time being. To bypass Bald Eagle Mountain south of Williamsport, local plans call for extending the U.S. Route 220 beltway south on the east side of the Susquehanna River along U.S. Route 147 to connect with the Shortway in the Milton area. From this point on the western bank of the river, an improved U.S. Route 15 could provide high-speed travel south to Harrisburg, Baltimore and Washington. These proposed improvements to U.S. Route 220 were to be financed by the Appalachian Regional Development Program. This envisions a limited access route from Milton north to Williamsport, and then south all the way to the Pennsylvania border in Bedford County. In Clinton County, this improved route would bypass Lock Haven and swing south through the Mill Hall Gap in Bald Eagle Mountain to follow the Shortway that parallels existing U.S. 220 to Milesburg. From there south to the Pennsylvania border, improved U.S. 220 would closely parallel its present alignment, (See Figure 3-2b).

Along this route, the State Highways Department expects to provide a new access spur to the Corps of Engineers ten mile-long lake that will be impounded within the next five years in Bald Eagle Valley between Blanchard and the Milesburg interchange on the Shortway. Routes to existing small communities that will be cut off from outside access by the lake, will be provided by the State Highways Department, as well as access routes to planned recreation areas along the lake.

In Centre County, the Centre Regional Planning Commission has gone on record favoring a State College by-pass close to the urban area, in preference to their consultant's recommended by-pass location further out. Three of the five Regional Planning Commission members favored this route because they felt that a controlled-access (rather than a limited-access) route close to the Borough would not create a barrier to Borough growth northward, as their opponents claim, and it would relieve Borough traffic congestion more effectively than a by-pass located further out.

In their submission to the State Highways Department, the Centre County Planning Commission gives the highest priority to building this close in controlled-access route north of State College and to a new controlled-access route carrying U.S. Route 322 directly northwest from Martha Furnace to Philipsburg. A four-lane highway connecting this route to the Kylertown interchange in Clearfield County with direct access to the Midstate Airport is also given high priority by the County Planning Commission. The Midstate Airport is also slated for improvement, (See Tables B-2 and B-3).

In addition, two alternative controlled-access routes are proposed: one from Potters Mills to Bellefonte over Nittany Mountains, and the other route from Potters Mills to the proposed State College by-pass. Though the County Planning Commission has expressed its preference for the Potters Mills to Bellefonte route, there are indications that the State Highways Department will give higher priority to the southern route through the rapidly growing southern portion of the country, (See Figure 3-5).

In contrast to the countywide highway concern expressed by Centre County's Planning Commission to the State Highways Department, the Clinton County Planning Commission has continued its recommendations for routes in the southern, more populous portion of its county, perhaps overlooking the need for better access highways into the sparsely populated northern plateau areas. A mobile home manufacturer in Renovo may have to curtail employment if better highway access to his factory is not provided. Improved access would involve widening of bridges, highway resurfacing, and correction of the current erosion action of the Susquehanna River which is undercutting U.S. Route 120's embankment at Renovo. Local interests have also expressed a desire that Pa. Route 144 be improved from Renovo north to U.S. Route 6 and south to the Shortway.

At present, it appears unlikely that the Appalachian Thruway (U.S. Route 220) may be built within the next six years. But such a high-speed facility would significantly reduce the time travel distance all along the Region's existing growth corridor from Bellefonte in the west to Muncy in the east, enhancing intra-regional commuting and thus the Region's available labor supply, and promoting further regional economic inter-dependency, (See Table C-1a). It will also accelerate the existing pattern of linear physical development, without which, an economic success may soon become a visual failure. No single County Planning Commission can resolve the problems of planning a regional "strip city" as effectively acting alone as it can in some form of regional association.

In Centre County, those highways that appear to have the highest building priority will serve the growing southeastern portion of the County too. As a result, State College's growth will be further stimulated and access to State College employment from depressed central Pennsylvania areas will become increasingly important. For this reason, U.S. 322 serving depressed Clearfield County, from which many of State College's commuters come, may be improved. In the meantime, there is still some doubt as to when or where a route will be built connecting U.S. 322 with the Shortway in the Bellefonte areas. If such a route is built, that municipality should grow. Due to its close proximity to two well traveled highways, Bellefonte would continue to share in Centre County's U.S. Route 220 and 64's corridor growth, (See Figure 3-5).

Centre County is at the geographic center of Pennsylvania. Two major transportation arteries of the county (U.S. Routes 220 and 64) follow the predominant topographic northeast-southwest pattern and connect the area with Altoona and Williamsport via Lock Haven. U.S. Route 322 runs across the ridges, southeast to Harrisburg. The Shortway will traverse the northcentral portion of the County, passing near Bellefonte about 12 miles north of State College.

Because of Region 8's geographic location and resulting poor access to large labor market areas, there is very little commuting to areas outside the Region. The Department of Internal Affairs estimated that in 1960, residents of Region 8 earned only $3.8 million more than was paid out by regional employers ($413 million). Within the Region, there is a sizeable net flow of commuters from Centre and Lycoming Counties to Clinton County (Piper Aircraft). In turn, 800 to 1500 people commute into Centre County to work in the State College area, many of these coming from Clearfield County, 15 miles west on U.S. Route 322.

The distance from major urban centers and the relative lack of accessibility have been factors impeding substantial growth within the Region. The future of these Counties will be dependent upon their ability to induce new industries. The new Keystone Shortway should stimulate some growth near its interchanges and with the planned improvement of U.S. 220 and U.S. 15, easier access to some of the now distant urban centers will be provided.

REGION 9

U.S. Route 219, passing through Region 9, forms one of the few major north-south routes in Pennsylvania. The southernmost portion of this route has been designated for improvement as a development highway under the Appalachia Program and should be reconstructed by 1969 as a four-lane limited-access facility from the Maryland border to Ebensburg, a few miles north of Johnstown. The Department of Highways had hoped to be able to extend this improvement of U.S. 219 north to intersect with the Shortway east of DuBois within the next twelve years. However, north of the Shortway between the Cities of DuBois and Bradford, this route is in equally poor condition. The worst section between Brandy Camp and Boot Jack Hill is currently being improved to a twenty-four foot pavement. At Boot Jack Hill, U.S. 210 plummets down a very steep grade into the Borough of Ridgway, and it is on this slope that trucks frequently lose control and either overturn in the ditch along the highway or crash into homes located on the edge of the town. Recognizing the need for a by-pass around this steep hill and the Boroughs of Ridgway and Johnsonburg, the State Highways Department is now working on plans for a general relocation of this section of U.S. 210, west of both Boroughs and the steep hill. Further north, a seven mile by-pass around Bradford, with four-lane limited-access will be built to connect with the New York State line, where a new two-lane road (with right-of-way reservation for expansion to four lanes) will continue north to intersect with New York's Route 17 "Quickway". The New York State Highway Department expects that the U.S. 210 improvements will eventually be extended north of New York 17 towards Buffalo, where it will join a new limited-access expressway already completed halfway south from that city. Acquisition of the necessary rights-of-way for the Bradford by-pass will begin soon. Because this route passes through the narrow valley in which the city is located, it necessitates eliminating several residences and threatens to impose a severe physical barrier to movement within the valley unless sufficient over-passes and under-passes are provided, (See Table C-1a).

One other regional highway improvement which will add to the accessibility of the Allegheny Reservoir recreation area has been the recent upgrading of an eight-mile section of a narrow two-lane township road into a twenty-four foot highway, and has been renumbered U.S. Route 59. This road connects the western portion of McKean County (Marshburg) and U.S. 219 with the Kinzua Dam. In addition, U.S. Route 6, the Region's major east-west highway, which traverses rough terrain through McKean and Potter Counties, is now scheduled for improvements along individual segments. One of these, a ten mile section between Port Allegheny and a point east of Roulette, is scheduled to be improved furing the next six years. The existing inadequate road will be improved and widened. Further east in Potter County, better connections between the private Potato City recreation development and Denton Hill State Park will be provided by similar highway improvements.

Scenic U.S. 120, following the gorges carved out by the Sinnemahoning Creek and the west branch of the Susquehanna River, is known as the "Bucktail Trail", and provides the only major highway access to Cameron County and western Clinton County. At the present time, sharp turns and narrow sections along this highway severely limit its commercial and industrial uses.

Future development of the Region hinges upon ultimate improvements to three major highways. These are the north-south U.S. 219 and east-west U.S. 6 and 120. The Region's most pressing economic development requirement is the completion of a high-speed link along U.S. 219 between the Keystone Shortway and the New York Quickway. The State Highways Department originally included this route among the proposed Appalachian Act Development Highways, but it was subsequently cut back to include only that segment in Somerset and Cambria Counties. Whenever funds permit, improvements to this road should receive the highest priorities in order for the Region to benefit fully from its recreation potential and to provide the industrial growth centers near St. Marys, Kane, and Bradford with access to rapid east-west transportation routes, (See Figure 3-2b).

U.S. Route 6 continues to be improved across the State on a piecemeal basis. The State Highways Department has proposed that this road be included in the Scenic Highway System and ultimately developed as a four-lane limited-access facility. As yet, no unified plan exists for the entire route, nor any assurance that current improvements can be incorporated into the future highway with its higher standards. Although the Highways Department is currently designing individual segments with regard to the road's scenic function, this function may well be jeopardized by roadside commercial proliferation, resulting from lack of access and billboard control.

Another requirement for the Region's development is improved access to the flourishing Susquehanna Valley near Williamsport. Improvements to U.S. 15, passing southward through Tioga and Lycoming Counties, may increase accessibility from Potter County, but is of little use to Cameron. The primary concern of Cameron County is U.S. 120, which has also been proposed as a "scenic highway". Highway improvements between Emporium and Lock Haven would permit greater use of Route 120 by commercial and industrial traffic, but such use might well jeopardize the highway's scenic quality. A conflict appears likely between the economic development requirements of tourism and those of industry, though the best of contemporary highway designs might meet both requirements in a single facility--especially in an area of such rugged topography. Unfortunately, the staggering construction costs, due to this topography, appear to exclude any prospects of improvement to U.S. Route 120 during the current Six Year Improvement Program, (See Figure 3-2b).

REGION 10

The Keystone Shortway, due to be completed about 1970, will have a major effect on Region 10. Presently, the Region is isolated from large urban centers; the Shortway will provide easier access to urban markets in the expanding Lower Great Lakes Area and Megalopolis to the east. The urban center near the Shortway interchanges will receive additional impetus for growth as they begin to provide services for the traffic along this important expressway.

A 25 mile portion of I-80 (the Keystone Shortway) between Corsica and Emerickville is already completed, and the remainder of the section within the Region is either in final design or under construction. However, the refusal by the City of DuBois to allow passage of the Shortway across its municipal watershed could delay the completion date for this one segment.

Pa. Route 322 from State College to Philipsburg is scheduled to be improved by relocating 14 miles of two-lane highway from Martha Furnace to the proposed Philipsburg by-pass. This improvement should reduce travel time to State College where many people from eastern Clearfield County find employment and encourage more commuting from this depressed coal mining area to the burgeoning economic growth area around State College.

To the south of Region 10, U.S. 219 will be made into a limited-access highway from Pennsylvania's southern border to Ebensburg. To the west of this route, U.S. 119 is given high priority for improvement into a four-lane divided highway from U.S. 22 to a point approximately six miles north of the Borough of Indiana. Current proposals envisage joining these two routes in the central portion of Clearfield County and extending a single new facility north to intersect with the Shortway west of DuBois, instead of several miles to the east of the city as originally proposed.

Pa. Route 28 which follows the Allegheny River Valley, connects Brookville in Jefferson County with Pittsburgh. Under the State Highway

Department's Six-Year Improvement Program, U.S. Route 28 is given high priority for improvement into a four-lane divided highway from Pittsburgh to Kittanning, (See Figure 3-2b). There is every likelihood that during the second six-year improvement program this upgrading will be continued northward to connect with the Shortway in the vicinity of Brookville, (See Table C-1a). With improvements to the Region's three major north-south highways, there will be easier access southward to Johnstown and Altoona, as well as to the large urban market around Pittsburgh. This improved access will benefit Region 10's dairy farmers and may partially offset the advantage that the Pennsylvania and Ohio Turnpike provide midwestern dairy producers, (See Table C-2).

Completion of the Keystone Shortway will lower costs of importing the raw materials used in manufacturing fire bricks as well as the costs of shipping the manufactured product to eastern urban markets, and thus help prevent further declines in this industry's markets and employment. Improved access to the Pittsburgh area would also lower the costs of shipping fire bricks to customers there. However, while the Borough of DuBois and Punxsutawney desire to have an improved Pa. Route 28 relocated closer to their communities, Brookville would like to have the improved highway remain near its present location.

Improvements to U.S. 119, as well as to Pa. Route 28, will also provide faster connections between coal mining areas in southern Clarion, Jefferson, and Clearfield Counties and the three proposed mine-mouth generating plants located in Armstrong, Indiana, and Westmoreland Counties. To the north, large numbers of trucks carrying coal from Region 10 along U.S. 219 to industries in Johnsonburg, St. Marys, and Bradford already illustrate the highway congestion problems posed by this industry.

While future improvements to routes connecting the Pittsburgh area with Region 10 may have the greatest long-range industrial impact upon this area, the Shortway, currently under construction, will provide an immediate major stimulant to tourism because it serves two of the largest urban residences. In addition, the normal traffic generated between these urban concentrations will stimulate increasing service and tourist industries for the small urban centers along this highway, (See Figure 3-6).

As previously noted, the City of DuBois halted construction of the Shortway across its municipal watershed. Consequently, highway construction was delayed on this short section of road, although the bridge that will span the raised reservoir has already been designed. If this problem is not settled quickly, valuable construction time will be lost.

The completion of the Keystone Shortway and scheduled improvements to the Region's major north-south highways will overcome many of the Region's poor access disadvantages. Whether the Region will be prepared to take advantage of this opportunity with a coordinated Region-wide pooling of promotional and financial efforts, the identification and development of a limited number of the Region's best potential industrial sites or the hiring of full-time professional industrial development managers remains uncertain. Completion of the Keystone Shortway in the early 1970's will accelerate the current trend of population away from the rural coal mining areas in the southern portion of the Region, toward the string of urban centers in the middle of the Region, parallel to the Shortway, (See Figures 3-2b and 3-5). A number of important interchanges are proposed along I-80 and growth is likely to occur near the Region's major north-south highways, U.S. 119 and U.S. 219. Future improvements to these arteries will provide better access to Altoona and Johnstown. In addition, a strong desire has been expressed by both Region 10 and Region 12 (Pittsburgh Area) for an extension of the proposed Allegheny River Valley Expressway beyond the planned terminus near Kittanning, Armstrong County, to some point on the Shortway, thus providing Region 10 with improved access to Pittsburgh markets.

While there is significant intra-regional commuting, a great number of workers also commute out of the Region. Many residents of eastern Clearfield County travel to jobs in State College in Centre County. Some commuting from the Region is occurring both northward to the prosperous St. Marys and Ridgway area in Elk County (Region 9) and, to a smaller degree, to the south and west. Employment opportunities outside of the Region will become even more accessible upon the completion of the Keystone Shortway. Much of the Region's current interest in local planning has been stimulated by construction of the Shortway. Punxsutawney' planning program calls for improvement to Pa. Route 119 which links this community to the Shortway. Similarly, Sandy Township (with two interchanges) in Clearfield County and Washington Township (one Interchange) in Jefferson County have zoned the land around their interchanges and, in the process, extended these controls to the rest of their township.

REGION 11

Two major east-west highways, U.S. Route 22 and the Pennsylvania Turnpike, pass through Region 11, providing good access to the large East Coast and Great Lakes urban centers. The former follows a northern route through the Region, skirting the area's two metropolitan cities, Johnstown and Altoona. In contrast, the Turnpike follows a southern route through a scenic and sparsely populated section closer to the Maryland border.

Three highways, U.S. 219, 220 and 522, comprise the major north-south routes through the Region. U.S. 219, the western-most route, crosses the high Allegheny Plateau providing Johnstown with direct contact with Buffalo; U.S. 220 connects Altoona with Williamsport and the Elmira-Binghamton area of New York State. Because of its location at lower elevations, U.S. 220 provides more favorable winter driving conditions than U.S. 219. Scenic U.S. Route 522, the eastern-most highway, serves a smaller population, but provides accessibility to the middle Susquehanna River communities and the anthracite coal district.

The recently constructed I-70, which terminates at the Breezewood Interchange of the Pennsylvania Turnpike, provides the rapidly expanding urban areas of Washington and Baltimore with access to this Region's vast recreation potential.

The impact of this new highway on Region 11 is reflected in the price of land near I-70 and the Turnpike interchanges at Breezewood. According to the Bedford County Tax Assessor, the most desirable parcels of land in this area have sold for over $40,000 per acre - high by any urban standards.

Since the construction of I-70, the Corps of Engineers, in its Potomac River Basin Plan, has decided to build two multi-purpose reservoirs in the southern part of Fulton County. One of these reservoirs, scheduled for construction in 1987, the Tonolway Creek Dam, will require three miles of relocation of this new highway in the vicinity of Werfordsburg.

Improvements to the Pennsylvania Turnpike are proposed for all of the tunnels which presently create traffic congestion. The Laurel Hill Tunnel has already been replaced by a new four-lane tunnel. At the site of the Allegheny Tunnel, a new tunnel will be cut through the mountain and the existing tunnel improved in order to provide four lanes of traffic through the mountain. To the east, a by-pass south of Ray's Hill and Sideling Hill Tunnels is scheduled for completion in the near future, and additional tunnels will be constructed through Tuscarora, Kittatinny and Blue Mountains to provide four-lane traffic through these mountains.

Under the State Highways Department's Six Year Improvement Program, U.S. Route 219 will be reconstructed into a four-lane divided highway, with limited access from the Maryland border to the Ebensburg by-pass. In addition, both U.S. 30 and U.S. 220 will by-pass the Borough of Bedford. To the north, a limited-access by-pass is proposed for U.S. Route 220 around Tyrone. Financing of these routes under the Appalachia Program was to be undertaken, with the Commonwealth contributing the 40 per cent local share and the Federal government the balance. If an additional $220 million is contributed to this program by the State, all U.S. Route 220 would be improved to four-lane limited-access standards from the Maryland State line to Williamsport with a connector route to the Shortway. If these additional funds are made available, all of U.S. Route 22 through the Region, with the exception of segments of improved highway from Ebensburg to Nanty Glo, would also be improved to a four-lane limited-access highway, (See Figures 3-2a and 3-2b).

Other improvements, financed under the general Federal Aid Primary Highway Program are scheduled for portions of U.S. 522 near Orbisonia in Fulton County.

Improved access to the central cities of Johnstown and Altoona is also planned. Near Johnstown, a four-lane controlled access highway will be built linking the city's central business district with limited-access U.S. 219, presently under construction east of the city, (See Table C-2).

In Altoona, the downtown business district is relatively isolated from the remainder of the city. Two bridges spanning the Pennsylvania Railroad assembly yards, provide the only access to the shopping district. The City's Redevelopment Authority is moving ahead with a major downtown redevelopment project which proposes a three-lane one-way highway connecting the two old bridges, which would feed traffic into the numerous off-street parking lots planned in the downtown district. The City Planning Commission believes that if the State Highways Department constructs two new bridges across the railroad yard barrier, they should be linked to U.S. Route 220 by high-speed connecting highways.

The U.S. Route 220 "Appalachian Thruway Association" and the U.S. 219 Association are promoting an extension of improvements to their respective north-south highways beyond the Region. In both instances, these routes would provide the rural population with improved access to the employment and shopping opportunities in the Region's two large metropolitan areas while affording Altoona and Johnstown industry a better connection with the State's major east-west highways and distant markets.

The prospects of improvement to another north-south route, U.S. 119, just to the west of Region 11, raise the question of whether State highway funds may be spread too thinly in this portion of Pennsylvania. It may be more sound to concentrate funds to improve one or two north-south highways rather than provide spot improvements to three.

Contrasted with rural north-south routes, U.S. Route 22 connects major eastern and western Pennsylvania urban areas. Improvements slated for this route could divert traffic from the Turnpike, to the south, through another part of Appalachia, as well as provide better regional access to Johnstown and Altoona. It is unfortunate that portions of the highway between Ebensburg and Nanty Glo provide no protection from strip commercial development of adjoining property, while the remainder of this route is scheduled for limited access. As a consequence, development is occurring along this uncontrolled segment which will ultimately slow down traffic and increase the accident hazard. This type of development can be prevented by improved techniques in long-range highway planning.

The potential advantage of Cambria's and Somerset's central location and proximity to market has been hampered by somewhat limited highway access. Highway access to Pittsburg from Johnstown is now only provided by Pa. Routes 56 and 22 to the north, and by U.S. Route 219 connecting with the Pennsylvania Turnpike to the south, (See Table C-2). A rail spur links Johnstown with the main line of the Pennsylvania Railroad, (See Figure 1-1). The Johnstown-Cambria County Airport provides facilities for limited commercial air service, (See Table B-2 and B-3). The designation of U.S. 219 and U.S. 22 as Appalachian Development highways was to have significantly improved this situation, but now that funds have been cut, the problem still exists.

Altoona, located midway between the Pennsylvania Turnpike and I-80, the Shortway, needs improvements of its north-south connections to these expressways, specifically along the routes of U.S. 220 and 22. Both of these are part of the Appalachian Development highways, whose funds are now lacking.

Pittsburgh's early development as the major "Gateway to the West" was attributable to its location at the confluence of the Allegheny and Monongahela on the headwaters of the Ohio River. These rivers determined the location of early Indian trails and pioneer roads which converged upon the flourishing young urban center of Pittsburgh.

Two of the Region's major east-west highways still follow the approximate alignment of historical colonial roads; the overland route from Philadelphia to Pittsburgh, known as Forbes Road, parallel to what is now U.S. 30, while to the south, the famous Cumberland Trail, terminating at Wheeling, has become U.S. 40.

With improved accessibility by overland trails from the east, Pittsburgh soon outdistanced its rivals, Buffalo and Wheeling, as a trans-shipment point to New Orleans for trans-Atlantic shipping. However, when the Erie Canal and railroads were built, Pittsburgh began to lose some of its prominence as a major inland port.

Railroad lines extending into this part of the State generally followed stream valleys because of their more gradual slopes. However, with the exception of Pa. Routes 18 and 29 which follow the Beaver and Allegheny Valleys, most of today's major highways cross the Region on the higher elevations of the Allegheny Plateau.

A system of radial highways now connects the ring of peripheral urban centers with Pittsburgh--U.S. 19 (to Washington and Waynesburg); Pennsylvania 51 (to Uniontown); U.S. 30 (to Greensburg): U.S. 22 (to Weirton, West Virginia); Pa. 28 (to Kittanning); Pa. 8 (to Butler) and Pa. 65 (to Aliquippa and Beaver Falls). For decades these early roads have carried the bulk of the Region's traffic load, but the advent of the Interstate Highways, to be described later on in this section, has greatly reduced some of this congestion.

Three other major trans-regional routes provide an outer circumferential system 25-30 miles out from Pittsburgh. In the northern part of the Region, U.S. 422 serves as the major east-west highway connecting Butler, Kittanning and Indiana with Altoona to the east and the Youngstown area to the west. As noted earlier east-west U.S. 40, south of Pittsburgh, connects Wheeling, West Virginia, with Washington and Uniontown. The only significant north-south artery in the eastern portion of the Region is U.S. 119,which generally follows along the western slope of Chestnut Ridge, linking Uniontown, Greensburg and Indiana.

The most recent addition to the highway network in western Pennsylvania has been the Interstate System which has had a tremendous impact upon Region 12. This new system provides numerous high-speed limited-access routes which now offer ready access to metropolitan Pittsburgh from areas both within and beyond the Region. The oldest segment of this network is the Pennsylvania Turnpike which provides a northern by-pass of Pittsburgh for regional and interstate traffic, and the most direct highway route to points in the Midwest and Megalopolis. Of more local concern is the fact that, in conjunction with two other Interstate roads, it completes a system of inner circumferentials, (See Figure 3-2b).

The other two arteries that comprise this "inner belt" are I-70 and 79. The latter, now under construction and referred to as the Erie-West Virginia Expressway, will pass through Pittsburgh's Golden Triangle and provide the major north-south highway for western Pennsylvania. This road will provide direct non-stop travel to the numerous recreation areas to the north. I-70 now connects Wheeling with the New Stanton Interchange, south of Greensburg (one of the busiest on the Turnpike) and serves as the major southern by-pass for Pittsburgh. This route provides very much improved access to the small towns along the Monongahela River, but is too far out from Pittsburgh (20 miles) to bring much relief to the inner metropolitan suburbs. I-76, the Penn-Lincoln Parkway, connects the Turnpike with I-79 and carries much of the traffic from U.S. 22, U.S. 30 and the Turnpike destined for downtown Pittsburgh. As a result, this road is especially congested at peak load hours during the weekdays. In order to alleviate heavy traffic along I-79, in downtown Pittsburgh, new limited-access I-279 is being designed to divert traffic around the central business district by crossing the Ohio River ten miles downstream.

As a first step in rounding out these Interstate Highways and creating a truly regional limited-access highway network, substantial additional improvements had been scheduled in the State Highway Department's current Six-year Improvement Program. During the 6-year period to end in July, 1973 over $336 million will be spent for the construction of more than 188 miles of new highways (mostly limited access) for Region 12. An additional $38 million is scheduled to be spent for 33 miles of Development Highways in Indiana and Westmoreland Counties under the Appalachia Program, (See Figure 3-2b). The high construction standards, rough terrain, and high urban land costs of these 220 miles of primary, urban, and Appalachia highways are expected to raise the total costs to approximately $1.7 million per mile. Expensive as these projects are, they appear essential if the Region's major transportation problems are to be overcome. The fact that Region 12, with 25 per cent of the State population, is scheduled to receive 26 per cent of total investment in new Pennsylvania highways during this six-year period, may be taken as some indication of official recognition of the priority requirements of the State's metropolitan areas' growing transportation crisis.

Appalachia funds were to be used to extend the limited access portion of U.S. 22, west from Ebensburg (Cambria County) to New Alexandria and the Greensburg By-pass. Although not part of the Appalachian System, U.S. 119 is scheduled for improvements as a four-lane by-pass around the Borough of Indiana. This route will be extended to a point approximately five miles north of the borough. The Route 119 Association, in Indiana Borough, would like to see this highway eventually improved as far as its junction with the Keystone Shortway near DuBois.

The proposed four-lane limited-access Allegheny Valley Expressway is to be extended from its present terminus at Blawnox to Pa. Route 28 to Kittanning, paralleling the Allegheny River for nearly forty miles. Several segments of the road will be constructed during the next six years. In addition, both north-south and east-west by-passes are to be built around Kittanning where U.S. Route 422 and Pa. 28 intersect. When completed, the Allegheny Valley Expressway will provide faster commuting to the center of Pittsburgh and will undoubtedly encourage rapid urbanization along the now relatively undeveloped, scenic river valley. Pittsburgh would like to see this road extended to Brookville (Jefferson County) to provide the metropolitan area with a second link to the Keystone Shortway and reduce travel time to recreation areas in the northern part of the State.

Further west, the State Highways Department proposes to widen an additional eleven-mile segment of Pa. 8 to a four-lane highway north of Butler. Regional proponents of this highway hope to see such improvement extended eventually as far as Venango County, in order to reduce travel time between Pittsburgh and the recreation areas of Venango, Forest and Warren Counties. According to the Highways Department, six additional portions of the highway in Venango County are now scheduled for improvement in the Six-year Improvement Program, (See Table 3-1a).

One of the most dramatic highway improvements proposed by the State Highways Department is a second major limited-access facility paralleling I-79 to the west, which will provide more direct access between Pittsburgh and the urban centers along the Ohio, Beaver and Shenango River Valleys. This highway would connect with I-279 (by-passing downtown Pittsburgh to the west) and U.S. 22. The latter route is scheduled for limited access extension from the Allegheny County line as far as Weirton, West Virginia.

Meanwhile, in Fayette County the principal concern has been the lack of major east-west highways. Although the Highways Department's Six-year Program will provide a new six-mile segment connecting U.S. 119 with the Turnpike at the New Staton Interchange and a western by-pass around Uniontown for U.S. 119 and U.S. 40 traffic, it has had to defer for the time being the county's hopes for a major improvement to Pa. 21 which links Uniontown with Waynesburg across the upper Monongahela. Finally, Fayette County is promoting the development for a Laurel Mountain Scenic Highway as a stimulus to its tourist industry.

Fayette County is not slated to be touched by an Interstate Highway. Butler County is also isolated except that it is crossed on the western edge by I-79. Indiana County is not crossed by the Interstate system; rather,its highways are largely of the standard 3 and 4 lane variety of which U.S. 119 is to be improved. Meanwhile Allegheny County is experimenting with mass transit proposals which will reduce the necessity of cutting more roads through the heart of built-up areas and perhaps result in a satisfactory long-term solution for workers commuting to the heart of the region.

River transportation is also important within the Region because the Ohio and Monongahela Rivers are navigable along their entire course in Pennsylvania. The Allegheny River is navigable as far as Brady's Bend in northern Armstrong County, a distance of about 70 miles from Pittsburgh. Along these waterways, coal, industrial chemicals and other basic raw materials are transported by barge between steel mills and other industrial plants. There is also an increasing out-of-State trade with ports along the Ohio and Mississippi Rivers to the Gulf of Mexico, thus providing Pittsburgh with cheap transportation to large markets in other parts of the nation. The greatest tonnage moving along the Monongahela River is coal,and the locks on this river are being enlarged to handle longer coal barge trains from the coal mines in Greene County to the coking ovens near Pittsburgh.

To extend this inland waterway system, the U.S. Corps of Engineers has proposed building a one billion dollar canal 20 miles west of the Pennsylvania State line connecting Lake Erie with the Ohio River. Proponents of the plan suggest that such a canal would cut transportation service costs for both the Pittsburgh and Youngstown metropolitan economies. Opponents maintain that the prospective benefits bear no reasonable cost-benefit relation to the investment required; that the resulting subsidized water transport would seriously harm current railway services, and that Youngstown's steel industry would be disproportionately benefited at the expense of Pittsburgh. The Pennsylvania State Planning Board sponsored a re-examination of the canal proposal in 1965. The conclusion was that the canal could not be economically justified.

Pittsburgh has kept pace with the times by becoming a major air traffic center. Within the last five years the sale of small executive aircraft has grown to such an extent that the availability of adequate general airport facilities has become an industrial development prerequisite While each county in Region 12 has its own general aviation airport, the facilities are too limited to accommodate large carrier aircraft. However, Allegheny County Airport, with larger runways, already serves as the major regional base for larger executive aircraft, and is expanding its runways to accommodate the latest generation of executive jets. Carrier planes use the Greater Pittsburgh Airport where more than ten commercial airlines and numerous feeder lines serve the Region. In fact, the City's airport actually handles more passengers (from 3 to 4 million annually) than does the Philadelphia International Airport. Like other metropolitan airports, the Greater Pittsburgh Airport (30 minutes from downtown Pittsburgh) can already accommodate large jet airliners, (See Table B-2 and B-3).

All of the industrial activity which might be found in Region 12 traces its origins back a few decades when railroads crisscrossed the area,competing with one another for freight business. Coal also remains a big business for railroads,and Region 12 accounted for about three fifths of the total bituminous coal produced in Pennsylvania in 1965, but the Region lacks and needs desparately more business services. As railroads have declined in importance and highway transportation has increased, the effect has been to encourage wholesalers to use outlying areas for their operations. But rugged terrain has inhibited this switch from rail to rubber, because most of the easily built roads have long since been constructed. Key routes which are expected to achieve the greatest results to congestion surrounding Pittsburgh are I-79, 279, and 70, The Beaver Valley Expressway and the Allegheny Expressway. The Pittsburgh area is served by numerous railroads, (See Figure 1-1). The most important of these are the Pennsylvania, Pittsburgh and West Virginia, Baltimore and Ohio and the Pittsburgh and Lake Erie (feeder line of the New York Central). Pittsburgh also contains numerous operating terminals for many major common motor carriers. Other terminals are scattered throughout the Region, especially in Greensburg, Washington and Beaver Falls. To service this motor and railroad traffic there are countless warehouses located in Pittsburgh and other smaller municipalities in the Region.

In recent years the City of Pittsburgh has become more accessible as a result of the construction of its many new expressways. Traffic also finds it easier to by-pass the city, both to the north and the south, because of the newly constructed Interstate Highways. Paradoxically, these new roads have created new problems of overcrowding. Many local residents have altered their past driving patterns to take advantage of these high speed facilities, and this induced traffic has generated new traffic congestion during peak rush hours which can be met only by a better balance of highway and rapid transit planning.

Although the Pittsburgh Area Transportation Study (PATS),prepared by a small section of the State Highways Department staff, conducted research and published their findings in 1963, the study was largely limited to identification of future major highway access corridors into Pittsburgh. However the Southwestern Pennsylvania Regional Planning Commission (SPRPC) absorbed the small PATS staff and undertook a six-county transportation study. This study covered all facets of transportation, including mass transit and air traffic. The study has resulted in the establishment of a working computer simulation model which is an outstanding tool in planning transportation changes in the Pittsburgh Area. (See Appendix C for discussion of SPRPC activities.)

The need for a mass transit system has already resulted in the consolidation of private bus and trolley lines in Allegheny County under the Pittsburgh Port Authority. Most recently a Rapid Transit Authority has been established in anticipation of the construction of a new rapid transit system in the Pittsburgh area, (See Table C-6).

While various studies of the Pittsburgh area are under way, residential, commercial and industrial development continues to decentralize outwards along the diverging radial highways. In a preliminary study, the Southwestern Pennsylvania Regional Planning Commission has proposed that this radial pattern be accepted as the logical pattern of future regional growth, but that local development controls insure that the population density of these developed corridors be kept high enough to support a mass transit system. With a network of radial highways, reinforced by a rapid transit system, quick access to the central city could assure the continued development of Pittsburgh's Golden Triangle as the business, tourist, convention and shopping center of Region 12.

The realization of such a pattern of future regional growth depends, however, upon concerted local government action now. The experience of other metropolitan centers, such as Washington, D.C., not only confirms the rationale of the radial corridor for 20th Century development, but also illustrates the inevitability with which natural urban growth tends to fill the intervening open lands between these corridors with undifferentiated urban sprawl. Such a process is already under way in Pittsburgh, and were it to continue unchecked, its first victim might be the visual and social identity of the Region's many individual urban communities.

Improvements to the existing radial highways emanating from Pittsburgh will stimulate growth along these arteries and their adjoining communities situated within easy commuting distance of the central city. The only major north-south highway in the eastern portion of the Region is U.S. 119. Improvements are already scheduled for a portion of this highway in Indiana County. However, this county remains relatively isolated from the Pittsburgh area because of the lack of a direct highway connection. Proximity to the Keystone Shortway will benefit Butler, Armstrong and Indiana Counties only if improvements are made to existing inadequate connector roads or new highway connections are constructed, (See Table C-1a and C-1b).

Region 12 has retained only moderate access advantage considering the growing importance of highway transportation. The Pennsylvania Turnpike provides direct expressway access to Philadelphia and New York and Chicago. I-70 and 79, will considerably improve direct north-south access from Pittsburgh, as well as to Washington, D.C. and to the lower Midwest. Access to this Region has been contained due to the rugged topography. Consequently interaction among the subcenters of this Region (2.5 million people) is less than would be the case in a metropolitan area of equal size on less formidible terrain. In general, intra-regional access is limited, emphasizing the need for a more complete intra-regional highway network, and a more efficient mass transit system. Improvements of highway and the mass transit system would expand the area in which people could commute to work. Employers could then recruit labor as well as expand the job opportunities. Pennsylvania Industrial Development Authority (PIDA) aided 84 projects (1956-65) with planned employment of 712,000. This attitude for self improvement is great in this Region. The Region will have to develop new specialties in the fast growing industries in order to provide the much needed additional employment opportunities. As a result Region 12 will be in a much better position to compete with other sections of the nation which are perhaps now ahead of it.

REGION 13

In the 4100 square mile area of Region 13, there are 10,000 miles of roads. Most of these roads are of narrow dimensions and are concentrated in four counties; Erie, Crawford, Mercer, and Lawrence. Many of the small service roads, designed to connect small towns in the Region, are being used by through traffic. The through traffic has increased to the point of presenting congestion problems in many small towns. However, much of the congestion created north-south traffic in the eastern portion of the Region will be relieved by construction of I-79, (See Figure 3-2b).

Sections of I-79 have already been completed between Pittsburgh and Erie. When I-79 is completed in 1971, it will connect downtown Pittsburgh and downtown Erie, (See Table C-2). I-79 will connect with I-90 at Erie. I-90, the route between Chicago-Cleveland and Buffalo, has already been completed. Reportedly, many residents of Erie now travel to Buffalo and Cleveland on I-79 to do business and to be entertained. However, with construction of I-79, Pittsburgh should be a good draw for the Region's purchase dollars as well as strengthening Pittsburgh's position as a purchaser of products made in Region 13.

A third Interstate road to have a great impact on the area is I-80, which crosses Venango and Mercer Counties in the southern part of Region 13. This new Interstate highway, to be completed in 1971, will be a major link between New York City and points west. All of the Region and, in particular, Mercer County should benefit greatly from construction of I-80. New opportunities for tourism will be opened, (See Figures 3-2a, 3-2b, Tables C-1a and C-1b).

Mercer and Lawrence Counties are linked with centers in Northwestern and Midwestern States; I-79 to Erie and Pittsburgh; I-80 to Cleveland and to New York; and the Pennsylvania-Ohio Turnpike to Chicago and to Philadelphia. The communities of Grove City and Mercer County are located strategically near the intersection of I-79 and 80. The area is served by four major railroads: Pittsburgh and Lake Erie, the Pennsylvania, the Baltimore and Ohio, and the Erie-Lackawanna. Mercer County is primarily responsible for the moderate growth of population experience in this area. Although the central cities, Sharon, Farrell, and New Castle have been losing population since 1950, the suburban townships and boroughs extending along U.S. Route 18 have been growing substantially.

Erie, Crawford and Warren counties are located in the northwest corner of the State and historically have been oriented to the Midwest and the Great Lakes. Erie in particular represents a significant transportation center in Pennsylvania. Good highway access is becoming a major asset along with the several limited-access highways: I-90 to Chicago and Buffalo, I-79 to Pittsburgh and south, and I-80 to the south and New York Route 17 to the east. Railroad facilities in the area are also good. But the Port of Erie has lagged in relation to other Great Lake ports vying for the iron and steel trade to the south.

An Erie Area Transportation Study clearly showed the influence that transportation has had on the growth and development of the area. The historical development of the industrial belt along the railroad lines extending both east and west from the original settlement of the port attest to the importance of transportation facilities on urban growth patterns.

Streets and highways,which account for approximately one-quarter of the total land, is the second largest user of urban land. Again, this stresses the importance of transportation to urban growth. If land is to develop,it must have access. Presently, travel speeds in Erie are lower than those uncommended by the National Committee on Urban Transportation. This is particularly true in the industrial areas on the fringe of the downtown. The major reason for these low operating speeds is delays due to inadequate signal control facilities. The system is rapidly approaching its capacity to offer adequate transportation service. Even with simple traffic operation modifications, a large porportion of the system is approaching capacity, a point where traffic operational procedures will no longer be able to retain a desired level of highway and street service. The estimated deficiences indicate that the present street system,supplemented by the construction of the Interstate Spur and Bayshore Expressways,will not be adequate to service the future travel demands in the Erie Area. Additional facilities must be planned if the area is to prosper and grow.

Erie too long has been cut off from the rest of Pennsylvania because the roads were so inadequate and so poorly maintained. The construction of I-79 from Pittsburgh to Erie,as previously mentioned,should have a substantial economic impact on both areas. Because of poor north-south access,Erie shipped, traded, and did business with Buffalo also one hour away on I-90, or with Cleveland, one and a half hours away on I-90. Traditionally, industrial ties have been east and west of Erie. Even the growth of the city has been east and west along the lake. When I-79 is completed new marketing areas will be opened for Erie-produced items, specifically for the fabricated metal industries in the area. Also, tourism should be improved. Presque Isle at Erie is a spectacular peninsula which has large sandy beaches and fine fishing. Erie is trying to get a bridge built over the channel to the east end of Presque Isle in order to facilitate the expected boom in auto traffic when Pittsburghians start coming to the lake in large numbers over I-79.

APPENDIX D

TRANSPORTATION-RELATED PLANS OF PRIVATE COMPANIES IN PENNSYLVANIA

Introduction

The plans of private companies often have significance for PennDOT administrators. The significance is three-fold. First, when company management decides to move to a new location, or expands existing operations, it most often creates new employment. New employment can be translated into needs for improving the streets, roads, highways and public transportation in an area to accommodate the increased number of passenger trips generated. Additionally, the availability of a good transportation infrastructure, *per se*, can be a plus factor in attracting new industry. Thus a PennDOT could often assist the Pennsylvania Department of Commerce in its efforts to make an area more attractive for new industrial location, for example, by means of a judicious road building program.

A second reason to recognize plans of private companies is that of providing adequate freight transportation to support manufacturing endeavors. Of course, the importance of good freight moving service varies by industry. The processing industries, for example, should be located where access to markets and material supplies are balanced to give the lowest overall freight costs. Conversely, electronics companies are seldom influenced by any freight rate savings because material movement costs are neglegible factors compared to availability of appropriately skilled labor.

A third reason to take note of plans by private companies is one that applies primarily to companies engaged in transportation. Such companies have the powers to supplement PennDOT activities or greatly alter its course of action. To some extent, the discussion of new technology in Appendix A deals with relevant plans of equipment manufacturers and thus illustrates the point. However, the most important private plans from PennDOT's standpoint are those made by companies which are engaged in moving people and materials, *e.g.*, bus companies, trucking companies, and railroads.

Obviously, it is not possible to collect and assimilate all of the plans of private companies in the State. However, it is possible to examine development trends among manufacturing companies in Pennsylvania and those coming to Pennsylvania in order to draw some conclusions relevant to planning PennDOT activities. Also, it is possible to examine, for relevance, certain elements of plans by private transportation companies which have volunteered to release this information. In the state of Pennsylvania, the most influential transportation company is the Penn Central Railroad. Its size, the fifth largest corporation in the United States, and its influence as a result of its extensive freight and passenger service in the east, make its plans of particular interest to a PennDOT. Thus, a discussion of the relevance of Penn Central's activities appears at the end of this Appendix. There are other large transportation companies, such as the Reading Railroad, which carry on activities relevant to PennDOT planning; but, limitations of time, space, and availability of information prohibited their discussion.

The initial portion of this Appendix deals with collective plans of private companies on a regional basis. Most of the data used is adapted from that supplied by the Pennsylvania Department of Commerce. Since the Department of Commerce assumes that manufacturing industry "provides the heat that warms the non-manufacturing and service industry employment," most of their focus is on development of manufacturing employment. Thus the data that was available relates chiefly to manufacturing. For purposes of convenience a Standard Industrial Code (SIC) is used in refering to different classification of industry. The list of SIC's and a description of the corresponding manufacturing industries appears in Table D-1.

As a start, it is helpful to know what the distribution of industries looks like in some base year. Table D-2 shows the distribution of manufacturing industries and manufacturing employment by region in 1964. (See Figure 2-1 for outline of the thirteen regions of the state). For example, as would be expected, Table D-2 shows a relatively high concentration of primary metals industries (SIC 33) in the Pittsburgh Region (Region 12). Allegheny County alone had almost 28% of the states employment in SIC 33. However, employments in some of the faster growing industries (SIC's 35, 37, 38 and 39) were each about 10% or less of the state totals. In order to determine whether or not historical industrial development is continuing to dominate, an analysis of new industrial development announcements was made by SIC and by Region (Table D-3). It should be noted that the announcements are only those on record at the Pennsylvania Department of Commerce. There is likely considerable additional industrial activity which is unrecorded because managements wish to keep their plans and decisions undisclosed. Also, the announcements of new plant additions or expansions of old plants are not definite commitments to follow through by announcing managements. Competitive conditions, etc., could influence implementations at later dates or cancel them. Also, Table D-3 is deficient in that it does not show industrial failures and withdrawals, *i.e.*, losses in employment. Nevertheless, Table D-3 shows the best available indicators for what most likely will happen soon in regard to industrial activity in the regions of the State.

The data presented in Tables D-2 and D-3 can be interpreted in terms of transportation requirements to support identifiable industrial trends which are favorable, or to counter unfavorable trends. One good source for relating types of industry to the extent and nature of transportation required for support is the publication, *Highways, Trucks and New Industry*, (American Trucking Association, Washington, D. C., 1963). The American Trucking Association surveyed 1,363 plants in the United States and collected some data about their transportation needs by industry type (SIC number). Interpretation of their findings is given in Table D-1.

The following regional analysis of industrial activity and corresponding implications for transportation development represent but a first cut at what might be done in a comprehensive master plan for a PennDOT. The Pennsylvania Department of Commerce could assist PennDOT by advising on transportation improvements which would lend support to industrial development.

TABLE D-1: STANDARD INDUSTRIAL CLASSIFICATIONS OF MANUFACTURING INDUSTRIES WITH APPROPRIATE TRANSPORTATION REQUIREMENTS

SIC Code	Industry Description	Mode Needed For Support			
		Rail		Truck	
		In	Out	In	Out
19	Ordinance				
20	Food and Kindred Products		✓	✓	
21	Tobacco Manufacturers				
22	Textile Mill Products	✓			✓
23	Apparel and Related Products			✓	✓
24	Lumber and Wood Products	✓	✓		
25	Furniture and Fixtures	✓	✓		
26	Paper and Allied Products	✓			✓
27	Printing, Publishing, and Allied Products			✓	✓
28	Chemicals and Allied Products	✓	✓		
29	Petroleum and Coal Products	✓	✓		
30	Rubber and Miscellaneous Plastics Products			✓	✓
31	Leather and Leather Products			✓	✓
32	Stone, Clay, and Glass Products	✓	✓		
33	Primary Metal Products	✓	✓		
34	Fabricated Metal Products	✓			✓
35	Machinery Except Electrical			✓	✓
36	Electrical Machinery, Equipment, and Supplies			✓	✓
37	Transportation Equipment	✓	✓		
38	Instruments and Related Products			✓	✓
39	Miscellaneous Manufacturers			✓	✓

*Source: Adapted from *Highways, Trucks, and New Industries*, American Trucking Association, 1963.

Table D-2. Distribution of Manufacturing Industries and Manufacturing Employment by Region in Pennsylvania in 1964

County	Standard Industrial Classification (SIC) Number																																									
	19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Bucks Establishments	1	5.3	56	2.0	1	1.3	37	4.6	36	1.7	23	2.1	30	5.2	18	4.7	46	2.1	24	3.8	2	1.4	32	10.2	3	1.2	51	5.1	15	2.6	74	4.3	87	5.2	32	5.6	13	5.2	14	5.5	20	3.4
Employees	+	0	1983	1.7	24	.2	1892	3.0	3397	2.0	265	2.0	836	3.2	2575	6.2	558	.9	3703	7.7	16	.1	1306	5.1	57	.1	1593	2.7	7867	3.5	2124	2.0	2153	1.8	2363	2.0	2514	3.9	3741	13.6	187	.6
Chester Establishments			47	1.7			11	1.4	13	.6	15	1.4	4	.7	14	3.6	39	1.7	22	3.5	2	1.4	7	2.2			14	1.4	12	2.1	41	2.4	41	2.4	11	2.0	5	2.0	5	2.0	4	.7
Employees			3268	2.8			757	1.1	1057	.5	181	1.11	311	1.2	1698	4.1	859	1.4	1944	4.0	15	.1	611	2.4			849	1.4	7063	3.1	1475	1.4	4118	3.6	963	.8	777	1.3	534	2.0	192	.7
Delaware Establishments	1	5.3	31	1.1			11	1.4	16	1.0	10	.9	7	1.2	14	3.6	74	3.3	26	4.2	2	1.4	16	5.1	1	.4	19	2.0	15	2.6	40	2.3	53	3.0	19	3.4	10	4.0	7	2.8	13	2.2
Employees	160	2.6	1579	1.3			1412	2.0	1126	1.0	244	2.0	394	1.5	3043	7.3	3481	5.5	2530	5.2	4507	31.0	513	2.0	35	.1	303	.5	1786	.8	1871	1.8	10315	9.0	1210	1.0	13190	17.3	256	1.0	624	2.8
Montgomery Establishments	4	21.1	86	3.1	1	1.3	43	5.4	45	2.1	25	2.3	22	3.8	28	7.3	93	4.2	51	8.2	5	3.4	36	11.5	5	2.0	67	6.6	32	5.5	111	6.4	156	9.1	71	12.5	20	8.0	27	10.7	27	4.6
Employees	2436	39.7	5359	4.5	83	.7	3300	5.0	3430	2.1	1484	3.9	880	3.4	2751	6.6	1829	2.9	6245	12.9	105	.7	5731	22.3	180	.5	4901	8.4	7364	3.3	9421	1.0	9130	7.8	7028	6.0	4624	5.3	2046	7.4	674	2.3
Philadelphia Establishments			378	13.7	10	12.8	250	31.7	570	26.7	47	4.3	159	27.7	136	35.3	661	30.0	191	30.6	21	14.4	61	17.5	46	19.2	69	6.8	72	12.3	457	26.4	368	21.1	136	24.0	32	12.7	84	33.2	216	36.8
Employees			29316	24.9	2076	18.4	18522	25.7	42107	23.0	661	5.3	4981	19.2	9895	23.8	26121	41.4	14709	30.1	4756	34.8	3249	12.7	2576	7.7	3341	5.7	5612	2.5	17259	16.5	11300	18.3	23200	19.5	12128	16.0	6249	22.7	5537	18.8
Region 1 Totals Establishments	6	31.7	598	21.6	12	15.4	352	44.5	680	32.1	120	11.	222	38.6	210	54.5	913	41.3	314	50.3	32	22	152	48.5	55	22.8	220	21.9	146	25.1	723	41.8	707	41.1	269	47.5	80	31.9	137	54.2	280	47.7
Employees	2596	42.3	41535	35.2	2202	19.3	25913	36.8	51817	28.6	1825	14.6	7402	28.5	19862	48	32840	52.1	29131	59.9	9599	66	11460	44.7	2848	8.4	10890	10.7	29692	13.2	32154	30.7	47106	40.4	34764	29.3	32833	43.2	12826	46.7	7414	25.2
Berks Establishments	1	5.3	114	4.1			101	12.8	59	2.7	21	1.9	18	3.1	18	4.7	54	2.4	16	2.4	4	2.7	7	2.2	11	4.6	27	2.7	38	6.5	55	3.2	56	3.2	24	4.2	15	6.0	5	2.0	12	2.0
Employees	21	.3	5242	4.5			9367	13.0	5072	2.7	253	2.0	884	3.4	1599	3.8	1093	1.6	1002	2.1	128	.9	133	.5	1786	6.3	794	1.4	6094	2.7	1926	1.8	5673	5.0	5741	4.8	3879	5.1	1178	4.3	750	2.5
Lehigh Establishments			64	2.3			58	7.4	95	4.4	5	.5	18	3.1	6	1.3	39	1.8	11	1.7	4	2.7	3	1.0	5	2.0	34	3.4	8	1.4	41	2.4	25	1.4	17	3.0	5	2.0	5	2.0	9	1.5
Employees			3702	3.1			3990	6.0	6970	4.0	60	.5	430	1.7	187	.5	1312	2.1	871	1.8	89	.6	80	.3	818	2.4	1578	2.7	594	.3	2916	2.8	2633	2.3	6908	5.8	3833	5.0	169	.6	953	3.2
Northampton Establishments			51	1.8			21	3.0	164	8.0	13	1.2	6	1.0	10	2.6	42	1.9	11	1.7	1	.7	6	2.0	1	.4	35	3.5	5	1.0	24	1.4	18	1.0	6	1.1			2	.8	11	1.9
Employees			1197	1.3			2663	4.0	12876	7.0	31	.2	282	1.1	1874	4.6	1779	2.8	570	1.2	5	.03	222	.4	165	.4	3187	5.4	15411	7.0	1762	1.7	1254	1.1	144	.8			12	.04	1340	4.5
Region 2 Totals Establishments	1	5.3	229	8.2			183	23.2	317	15.1	39	3.6	42	7.2	33	8.6	135	6.1	37	5.8	9	6.1	16	5.2	17	7.0	96	9.6	51	8.9	120	7	99	5.6	47	8.3	20	8.	12	4.8	32	5.4
Employees	21	0.3	10441	8.9			16020	23	24928	13.7	344	2.7	1596	6.2	3654	8.8	4154	6.5	2443	5.1	222	1.53	435	1.7	2769	6.1	5559	9.5	22099	10	6604	6.3	9560	8.4	13593	11.4	7712	10.1	1359	4.94	3043	10.2
Monroe Establishments			5	.2			11	1.4	16	.7	6	.5	1	.2	1	.3	9	.4	2	.3	1	.7	2	.6	1	.4	8	.8	3	.5	7	.4	7	.4	3	.5			1	.4	5	1.0
Employees			97	.08			316	.4	782	.4	31	.2	48	.2	111	.3	590	.9	198	.4	30	.2	105	.4	85	.2	89	.2	140	.1	757	.7	147	.1	320	.3			13	.05	738	2.5
Pike Establishments			3	.1			1	.1	1	.1	6	.6					1	.05	1	.2			1	.3							3	.2	2	.1	1	.2	1	.4			1	.2
Employees			26	.02			7	.01	27	.01	14	.1					4	.01	17	.04			+	0							8	.01	5	.001	2	.002	15	.02			14	.1
Wayne Establishments			7	.3							23	2.1	5	.9			6	.3	2	.3	3	2.1	2	.6			5	.6	2	.3	9	.5	10	.6	7	1.2	4	1.6			1	.2
Employees			236	.2							321	2.6	299	1.2			192	.3	29	.06	269	1.9	83	.3			113	.2	2208	1.0	1213	1.2	192	.2	495	.4	117	.2			22	.1
Region 3 Totals Establishments			17	0.6			24	3.5	25	1.2	35	2.9	3	0.5	1	0.3	16	.75	4	.7	2	1.4	5	1.5	2	0.8	10	0.8	3	0.5	10	0.6	10	0.6	5	0.9	1	0.4	1	0.4	8	
Employees			194	.16			540	.71	1969	1.01	205	1.6	231	0.9	111	0.3	619	.95	220	.48	33	22	165	0.6	135	0.3	156	0.2	140	0.1	765	.71	153	.109	418	.402	15	.02	13	.05	759	2.62
Bedford Establishments			11	.4			3	.4	4	.2	12	1.1			2	.5	13	.6	1	.2	1	.7	2	.6	2	.8	3	.3	3	.5	1	.1	8	.5	2	.4	1	.4	1	.4	2	.3
Employees			288	.2			192	.3	559	.3	145	1.2			192	.5	280	.4	23	.06	26	.2	107	.4	140	.4	32	.05	1070	.5	28	.03	1628	1.4	253	.2	6	.01	54	.2	161	.5
Fulton Establishments			2	.05					2	.1	13	1.2					1	.05							1	.4																
Employees			68	.05					210	.1	223	1.8					+	0							449	1.3																
Huntingdon Establishments			11	.4			1	.1	6	.3	10	1.0			1	.3	5	.2			1	.7			3	1.2	3	.3	2	.3	4	.2	2	.1	1	.2	2	.8				
Employees			119	.1			28	.04	1165	.3	261	2.1			20	.1	60	.1			3	.02			430	1.2	+	0	185	.1	75	.1	30	.2	20	.02	675	.8				

Percent Pennsylvania total

Data not available, missing.

Source: Adapted from data provided by the Department of Internal Affairs, Commonwealth of Pennsylvania.

Table D-2. Distribution of Manufacturing Industries and Manufacturing Employment by Region in Pennsylvania in 1964 (cont.)

County	Standard Industrial Classification (SIC) Number																																									
			20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Wayne Establishments			9	.3							14	1.3					5	.2							2	.8	2	.2	2	.3	3	.2	2	.1			1	.4			2	.3
Employees			196	.2							128	1.0					40	.1							727	2.1	538	.9	213	.1	368	.4	140	.1			76	.1			11	.04
Wyoming Establishments			10	.4			1	.1	8	.4	9	1.0	5	.9											1	.4	1	.1					1	.1			1	.4				
Employees			123	.1			16	.02	520	.3	57	.5	13	.1											210	.6	6	.01					9	.01			11	.01				
Region 4 Totals Establishments			43	1.57			5	0.6	20	1.0	58	5.6	5	0.9	3	0.8	24	1.05	1	0.2	2	1.4	2	0.6	9	3.6	9	0.9	7	1.1	8	0.5	13	0.8	3	0.6	5	2	1	0.4	4	0.6
Employees			784	0.65			236	.36	1754	1.0	814	6.6	13	0.1	212	0.6	380	0.6	23	.05	29	.22	107	0.4	1956	5.6	576	.241	1468	0.7	471	.53	1807	1.71	273	.22	768	.92	54	0.2	172	.54
Carbon Establishments			19	.7			8	1.0	45	2.1	2	.2	5	.9			10	.5	4	.6			1	.3	3	1.2	4	.4	4	.7	1	.1	1	.1	5	.9	1	.4			4	.7
Employees			188	.2			392	1.0	4010	2.2	47	.4	102	.4			58	.1	101	.2			1	.004	454	1.3	78	.1	2239	1.0	21	.02	30	.03	1408	1.2	47	.6			118	.4
Luzerne Establishments			129	4.9	8	10.2	38	5.0	266	12.4	20	1.8	22	3.8	8	2.1	62	2.8	15	2.4	2	1.4	9	2.7	20	8.3	26	2.6	8	1.4	35	2.0	116	2.7	12	2.1	17	6.8	2	.6	26	4.4
Employees			3709	3.2	3632	31.8	3231	4.5	19419	11.0	172	1.4	1293	4.9	225	.5	1119	1.8	718	1.5	28	.2	1446	5.6	3346	10.0	482	.8	656	.3	2076	2.0	2616	2.3	1342	1.2	1653	2.2	10	.04	2161	7.3
Schuylkill Establishments			71	2.6	1	1.3	26	3.3	114	5.3	19	1.7	3	.5	4	1.0	22	1.0	5	.8	2	1.4	1	.3	6	2.5	17	1.7	3	.5	14	.8	10	.6	3	.5	2	.8	3	1.2	4	.7
Employees			1364	1.2	653	5.7	2551	4.0	11524	6.2	111	.9	354	1.4	227	.5	321	.5	1244	2.6	103	.7	120	.5	638	1.9	339	.7	1515	.7	898	1.0	211	.2	114	.1	463	.6	52	.2	128	.4
Region 5 Totals Establishments	4	21.1	301	11	12	15.3	95	12.3	589	27.8	51	4.6	47	8.1	17	4.4	142	6.5	37	5.9	4	2.8	21	6.7	34	14	63	6.3	23	4	90	5.2	81	4.7	32	5.6	26	10.4	7	2.8	59	10.1
Employees	1184	19.3	7430	6.6	5133	44.9	8943	13.5	46973	25.6	397	3.2	2411	9.3	906	2.1	3997	6.4	2283	4.7	131	0.9	2614	10.2	5881	17.5	1373	2.3	4463	2.0	5033	5.0	4471	3.9	5665	4.8	2589	3.9	140	.54	3442	11.6
Adams Establishments			19	.7	2	2.5	1	.1	10	.5	15	1.4	8	1.4	4	1.0	8	.4	3	.5	2	1.4	3	10	9	3.7	10	1.0	9	.5	2	.1	4	.2	1	.2					3	.5
Employees			1971	1.7	81	.7	147	.2	617	.3	94	.8	441	1.7	275	.7	189	.2	103	.2	25	.2	448	1.7	2264	6.7	546	.7	290	.1	82	.1	109	.1	17	.01					51	.2
Cumberland Establishments			32	1.2	1	1.3	5	1.0	13	.6	11	1.0	3	.6	6	1.6	20	.9	4	.6	1	.7	2	.6	5	2.1	16	1.6	2	.3	10	.6	11	.6	12	2.1	2	.8	1	.4	3	.5
Employees			1319	1.1	9	.08	1504	2.1	1110	.6	68	.5	23	.1	385	.9	203	.3	22	.04	21	.1	566	2.6	994	2.9	304	.5	420	.2	1268	1.2	440	.4	2103	1.8	48	.1	1	.004	125	.4
Dauphin Establishments			75	2.7	1	1.3	1	.1	30	1.4	9	.8	4	.7			44	2.0	5	.8	2	1.4	1	.3	11	4.6	12	1.2	4	.7	22	1.3	15	.8	4	.7	5	2.0	1	.4	5	1.0
Employees			6515	5.5	175	1.5	59	.1	2828	1.5	103	.8	148	.6			1398	2.2	36	.07	6	.04	7	.03	2100	6.2	307	.5	3178	1.4	2196	2.1	983	.8	630	.5	855	1.1	6	.02	39	.1
Franklin Establishments	1	5.3	29	1.0			2	.3	10	.5	23	2.1	3	.5	1	.3	13	.6			1	.7	1	.3	2	.8	8	.8			7	.4	16	1.0	1	.2	7	2.8	2	.8	1	.2
Employees	1	.2	1134	.9			335	.5	3438	2.0	162	1.3	48	.2	54	.1	174	.3			3	.02	79	.3	424	1.2	188	.5			196	.2	4245	3.6	2	.002	540	.7	57	.2	1	.003
Lancaster Establishments			131	5.0	10	12.8	19	2.4	59	3.0	34	3.1	20	3.5	11	2.9	74	3.3	17	2.7	4	2.7	1	.3	25	10.4	29	3.0	34	5.8	60	3.5	65	4.0	16	1.8	16	4.0	7	2.8	24	4.1
Employees			11250	4.0	561	5.0	2036	3.0	6365	3.4	542	4.3	516	1.9	580	1.4	2037	3.2	956	2.0	68	.5	63	.2	3256	9.7	608	1.0	2429	1.1	4628	4.4	4363	3.7	5243	4.4	1874	2.5	1907	6.9	3974	13.5
Lebanon Establishments			46	2.0			13	2.0	39	2.0	6	.5			6	1.6	18	.9	6	1.0	1	.7	5	1.6	9	3.7	8	.8	8	1.4	10	.6	13	.8	1	.2					3	.5
Employees			1251	1.1			1448	2.0	3390	2.0	50	.4			444	1.1	422	.7	612	1.3	14	.1	335	1.3	1472	4.4	474	.8	1572	.7	2574	2.6	233	.2	42	.04					28	.1
Perry Establishments			10	.4					10	1.0	8	.7					9	.4							1	.4	1	.1					3	.1							1	.2
Employees			150	.1					692	.4	71	.6					30	.1							20	.1	4	.002					15	.01							22	.1
York Establishments	11	21.1	113	4.1	33	42.3	24	3.0	64	3.0	32	2.9	44	7.7	23	6.0	68	3.0	7	1.1	7	11.8	8	2.6	14	5.8	31	3.1	16	2.7	50	3.0	79	4.6	20	3.5	8	3.2	5	2.0	14	2.4
Employees	1991	32.6	4961	4.2	1161	12.6	3556	5.0	5615	3.0	548	4.4	3837	14.8	2795	6.7	2386	3.8	287	.6	384	2.6	397	1.5	2276	6.8	967	1.6	732	.3	3891	3.7	6802	5.8	1824	1.5	453	.6	704	2.5	483	1.6
Region 8 Totals Establishments	5	26.4	455	17.1	47	60.2	65	8.9	235	12	138	12.5	82	14.3	51	13.4	254	11.5	42	6.7	18	12.4	21	6.7	76	31.5	115	11.6	67	11.4	161	9.5	209	12.1	49	8.7	32	12.8	16	6.4	54	9.4
Employees	1992	32.7	21551	18.6	2287	20.1	9085	12.9	24055	13.2	1638	13.1	5013	19.3	4533	10.9	6789	10.8	2017	4.2	521	3.56	1995	7.6	12798	38	3248	5.4	8621	3.8	14835	14.3	17190	14.6	9861	8.25	3770	5.0	2675	9.0	4723	16.0
Columbia Establishments			27	.9	1	1.3	17	2.2	19	.7	7	.6	2	.3	2	.5	10	.5	1	.2	1	.7					9	1.0	3	.5	1	.1	4	.2	2	.4	3	1.2	3	1.2	1	.2
Employees			1512	1.3	695	6.1	3664	5.1	1876	1.0	171	1.4	40	.2	89	.2	158	.3	11	.02	8	.06					58	.1	111	.05	21	.02	213	.2	226	.2	511	.7	236	1.0	15	.1

Percent Pennsylvania total

Data not available, missing.

Source: Adapted from Data compiled by the Department of Internal Affairs, Commonwealth of Pennsylvania.

Table D-2. *Distribution of Manufacturing Industries and Manufacturing Employment by Region in Pennsylvania in 1964 (cont.)*

Standard Industrial Classification (SIC) Number

County	19		20		21		22		23		24		25		26		27		28		29	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Juniata																						
Establishments			8	.3					9	.4	15	1.4	2	.3			4	.2				
Employees			201	.2					749	.4	67	.5	180	.7			9	.01				
Mifflin																						
Establishments			17	.6					2	.1	11	1.0	3	.5			6	.3	1	.2	1	.7
Employees			371	.3					674	.4	87	.7	86	.3			68	.1	1853	3.8	4	.03
Montour																						
Establishments			2	.007			1	.1	1	.1			1	.2			3	.1			1	7
Employees			3	.0025			493	.6	300	.2			225	.8			31	.1			6	.04
Northumberland																						
Establishments			45	1.6	1	1.3	8	1.0	40	2.0	9	1.0	5	.9	4	1.0	12	.5	5	.8	1	.7
Employees			2728	2.9	325	2.8	807	1.1	5252	3.0	376	3.0	1013	3.9	348	.8	339	.5	523	1.1	27	.2
Snyder																						
Establishments			12	.4			6	.7	13	.6	11	1.0	4	.7	1	.3	5	.2				
Employees			182	.2			485	.7	878	.5	82	.7	287	1.1	67	.2	22	.04				
Union																						
Establishments			8	.3			3	.4	2	.1	3	.3	4	.7			6	.3			1	.7
Employees			106	.009			250	.3	139	.1	6	.1	889	3.4			147	.2			22	.2
Region 7 Totals																						
Establishments			119	4.1	2	2.6	35	4.4	86	4.2	56	5.3	21	3.6	7	1.8	46	21	7	1.2	5	3.5
Employees			5103	4.3	1020	8.9	5639	7.8	9888	5.6	792	6.4	2720	10.4	504	1.2	774	1.25	2387	4.9	67	.53
Centre																						
Establishments			15	.5	1	1.3	2	.3	5	.2	12	1.1	1	.2	1	.3	13	.6	3	.5		
Employees			315	.3	719	6.3	129	.2	620	.3	57	.6	32	.1	6	.01	132	.2	109	.2		
Clinton																						
Establishments			14	.5			2	.3	4	.2	7	.6	1	.2	3	.8	8	.4	5	.8	1	.7
Employees			155	.1			590	.8	472	.3	35	.3	134	.5	1526	3.7	95	.2	379	.8	5	.3
Lehigh																						
Establishments			64	2.3			58	7.4	95	4.4	5	.5	18	3.1	6	1.3	39	1.8	11	1.7	4	2.7
Employees			3702	3.1			5990	6.0	6970	4.0	60	.5	430	1.7	157	.5	1342	2.1	871	1.8	89	.6
Region 8 Totals																						
Establishments			62	2.2	1	1.3	15	2.0	22	1.0	54	4.9	15	27	8	2.1	46	2.1	13	2.1	2	1.4
Employees			1540	1.3	719	6.3	3083	4.3	128	1.8	867	7.0	1941	7.4	2207	5.3	835	1.4	657	1.4	11	.34
Cameron																						
Establishments											3	.3					2	.1				
Employees											65	.5					7	.01				
Elk																						
Establishments			11	.4							4	.4			2	.5	6	.3	4	.6		
Employees			189	.2							88	.7			905	2.2	56	.1	201	.4		
McKean																						
Establishments			13	.5							22	2.0	3	.5	3	.8	9	.4	11	1.7	3	2.1
Employees			192	.2							258	2.1	361	1.4	275	.7	211	.3	191	.4	564	3.9
Potter																						
Establishments			5	.2					1	.1	15	1.4	2	.3			3	.1	3	.5		
Employees			46	[illegible]					7	.004	169	1.4	42	.2			39	.1	55	.1		
Region 9 Totals																						
Establishments			29	1.1					1	0.1	44	4.1	5	0.8	5	1.3	20	0.9	18	2.8	3	2.1
Employees			427	.41					7	.04	580	4.7	403	1.6	1180	2.9	313	.51	450	0.9	564	3.9
Clarion																						
Establishments			15	.5							18	1.6	2	.3	1	.3	4	.2	1	.2	1	.7
Employees			172	.1							159	1.3	169	.7	52	.1	33	.1	†	0	7	.05

County	30		31		32		33		34		35		36		37		38		39	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Juniata																				
Establishments					3	.3			1	.1										
Employees					12	.02			1	.001										
Mifflin																				
Establishments					7	.7	4	.7	3	.2	2	.1	1	.2	1	.4			2	.3
Employees					107	.2	1950	1.0	66	.1	613	.5	582	.5	132	.2			20	.1
Montour																				
Establishments					1	.1	1	.2			2	.1			1	.4			1	.2
Employees					12	.02	1	.0004			512	.3			798	1.1			2	.01
Northumberland																				
Establishments	3	1.0	3	1.2	13	1.3	5	1.0	9	.5	3	.1			4	1.6	2	.8	7	1.2
Employees	6	.02	1403	4.2	324	.6	606	.3	326	.3	50	.04			980	1.3	11	.04	498	1.7
Snyder																				
Establishments			3	1.2	4	.4			2	.1	1	.1			4	1.6				
Employees			313	.9	34	.06			122	.1	4	.003			321	.4				
Union																				
Establishments					2	.2	2	.3	1	.1	1	.1	1	.2						
Employees					17	.3	25	.01	1	.001	23	.02	225	.2						
Region 7 Totals																				
Establishments	3	1.0	6	24	39	4	15	2.7	17	1.1	13	0.7	4	0.8	13	52	5	2.0	11	1.9
Employees	6	.02	1716	5.1	564	1.3	2693	1.36	537	.52	1215	1.1	1033	0.9	2742	37	247	1.04	535	1.9
Centre																				
Establishments					8	.8	2	.3	1	.1	3	.2	4	.7			6	2.4	2	.3
Employees					797	1.4	1238	.6	4	.004	191	.2	626	.5			1112	4.0	2	.01
Clinton																				
Establishments					3	.3	1	.2	1	.1	1	.1	1	.2	3	1.2			2	.3
Employees					48	.08	202	.1	†	0	1	.001	474	.4	2286	3.0			20	.1
Lehigh																				
Establishments	3	1.0	6	2.0	31	3.4	8	1.4	41	2.4	25	1.4	17	3.0	5	2.0	5	2.0	9	1.5
Employees	80	.3	818	2.4	1578	2.7	594	.3	2916	2.8	2633	2.3	6908	5.8	3833	5.0	169	.6	953	3.2
Region 8 Totals																				
Establishments	3	1.0	6	25	21	2.1	6	1.0	20	1.2	16	1.0	11	2.0	6	2.4	8	3.2	7	1.1
Employees	262	1.0	609	1.8	965	1.68	1650	0.8	2688	2.6	1178	1.0	3103	2.6	4354	5.7	1177	4.2	277	1.1
Cameron																				
Establishments							2	.3	4	.2	1	.1	1	.2						
Employees							201	.1	50	.05	21	.02	1183	1.0						
Elk																				
Establishments					5	.5	6	1.0	4	.2	8	.4	4	1.1						
Employees					141	.2	1179	.5	87	.1	68	.1	4424	37						
McKean																				
Establishments			2	.8	6	.6	1	.2	8	.5	8	.4	3	.5			1	.4	5	1.0
Employees			99	.2	941	1.6	5	.002	1387	1.3	550	.5	1993	1.7			2	.01	491	1.6
Potter																				
Establishments	1	.3	2	.8					2	.1			6	1.1			3	1.2		
Employees	9	.04	103	.3					68	.1			566	.5			27	.1		
Region 9 Totals																				
Establishments	1	0.3	4	1.6	11	1.1	9	1.5	18	1.0	17	0.9	14	2.9			4	1.6	5	1.0
Employees	9	.04	202	0.5	1082	1.8	1385	0.6	1592	1.1	639	.62	8166	6.9			29	.11	491	1.6
Clarion																				
Establishments	1	.3			11	1.1			4	.2	8	.2	1	.2	2	.8	1	.4	1	.2
Employees	181	.7			1511	2.6			58	.05	13	.01	275	.2	134	.2	56	.2	3	.01

*Percent Pennsylvania total.

†Data not available, missing.

Source: Adapted from data provided by the Department of Internal Affairs, Commonwealth of Pennsylvania.

Table D-2. Distribution of Manufacturing Industries and Manufacturing Employment by Region in Pennsylvania in 1964 (cont.)

County	Standard Industrial Classification (SIC) Number																																									
	19		20		21		22		23		24		25		26		27		28		29		30		31		32		33		34		35		36		37		38		39	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Clearfield																																										
Establishments			17	.6			2	.3	8	.4	38	3.4	3	.5	1	.3	9	.4			1	.7			2	.8	9	1.0	1	.2	5	.3	5	.3	2	.4			1	.4	1	.2
Employees			634	.5			337	.6	1096	.6	247	2.0	19	.1	229	.6	157	.3			4	.3			214	.6	718	1.2	88	.04	349	.3	125	.1	263	.2			517	2.2	10	.03
Jefferson																																										
Establishments			11	.2					4	.2	22	2.0	1	.2			10	.5	2	.3	1	.7			1	.4	7	.7	3	.5	5	.3	9	.5	3	.5	3	1.2			1	.2
Employees			145	.1					440	.02	149	1.2	18	.1			137	.2	3	.006	6	.04			493	1.4	1938	3.3	95	.64	125	.1	228	.2	471	.4	43	.1			44	.2
Region 10 Totals																																										
Establishments			43	1.3			2	0.3	12	0.6	78	7.0	6	1.0	2	0.6	23	1.1	3	0.5	3	2.1	1	0.3	3	1.2	27	2.8	4	0.7	14	0.8	17	1.0	6	1.1	5	2.0	2	0.8	3	0.6
Employees			951	0.7			337	0.5	1536	.62	555	4.5	206	0.9	281	0.7	329	0.6	3	.006	17	.39	181	0.7	707	2.0	4167	7.1	183	.08	832	.45	366	.31	1009	0.8	177	0.3	653	2.4	57	.24
Bedford																																										
Establishments			7	.3					3	.1	22	2.0					4	.2	1	.2					1	.4	1	.1			2	.1	1	.1								
Employees			75	.1					667	.3	329	2.6					140	.2	12	.02					385	1.1	5	.008			39	.04	194	.2								
Blair																																										
Establishments			52	1.8			2	.3	4	.2	10	.9	5	.8	5	1.3	18	1.0	5	.8					4	1.6	18	1.8	2	.3	6	.4	7	.4	3	.5	3	1.2	2	.8	6	1.0
Employees			1824	1.5			1495	2.1	875	.6	67	.5	39	.2	1969	4.7	756	1.2	96	.2					1646	4.9	387	.7	205	.1	698	.6	687	.6	1348	1.1	150	.2	357	1.9	268	1.0
Cambria																																										
Establishments			34	1.2					18	1.0	30	2.7	6	1.0	1	.9	25	1.1	1	.2	2	1.4	1	.3	3	1.2	15	1.5	3	.5	14	.8	12	.7	4	.7	5	2.0	1	.4	5	1.0
Employees			1276	1.1					2998	1.6	251	2.0	117	.6	5	.01	368	.6	19	.04	14	.1	1	.004	311	1.0	363	.6	10870	4.8	1604	1.5	286	.3	60	.04	2313	3.1	84	.3	33	.1
Huntingdon																																										
Establishments			7	.3					1	.1	24	2.2			1	.3	7	.3			2	1.4	1	.3	2	.8	7	.7	1	.2	4	.2			3	.6					1	.2
Employees			107	.1					710	.4	150	1.2			220	.5	135	.2			10	.03	217	.8	603	1.5	1129	1.9	2	.001	91	.1			340	.3					10	.003
Somerset																																										
Establishments			19	.7	1	1.3			12	1.0	30	2.7	3	.6			15	.7	1	.2	1	.7	2	.6	2	.8	11	1.1	1	.2	6	.4	6	.3	2	.4	1	.4	2	.8		
Employees			350	.3	11	.01			2323	1.3	311	2.6	106	.4			137	.2	32	.05	34	.2	26	.1	77	.2	205	.4	49	.02	178	.2	86	.1	58	.15	47	.1	100	.4		
Region [illegible]																																										
Establishments			121	4.4	1	1.3	2	0.3	39	2.5	130	11.8	14	2.3	7	1.9	71	3.4	8	1.4	6	4.2	4	1.2	12	4.8	54	5.4	7	1.2	32	1.9	26	1.5	12	2.1	9	3.6	5	2.0	12	2.2
Employees			3645	3.11	11	.01	1495	2.1	7928	4.3	1140	9.1	261	1.1	2194	5.2	1540	2.4	159	.33	62	0.4	244	.90	2922	8.7	2141	3.7	11146	4.9	2510	2.4	1253	1.2	1796	1.49	2510	3.3	541	2.0	311	1.1
Allegheny																																										
Establishments			288	10.4	2	2.5	1	.1	59	2.7	27	2.4	55	9.6	22	5.7	298	13.3	72	11.5	20	14.0	23	7.3	8	3.3	102	10.1	74	12.7	235	13.7	173	10.0	41	7.2	17	6.7	30	11.2	61	10.1
Employees			16843	13.5	3	.02	12	.02	1066	.6	389	3.1	1253	4.8	2198	5.3	6377	10.1	3331	6.9	511	3.5	2060	8.0	77	.2	6068	10.4	62043	27.6	13253	12.7	10183	8.9	13702	15.5	7465	10.1	2411	8.8	2738	9.3
Armstrong																																										
Establishments			19	.7					3	.1	15	1.4	2	.3			9	.4	5	.8	1	.7					22	2.2	2	.3	6	.3	5	.3	1	.2						
Employees			805	.7					96	.1	141	1.1	143	.6			86	.1	639	1.3	8	.06					3606	6.2	36	.02	354	.3	35	.03	23	.02						
Beaver																																										
Establishments			44	1.6			1	.1	2	.1	3	.3	2	.3	1	.3	22	1.0	9	1.4	3	2.1	3	1.0			32	3.2	25	4.9	22	1.3	18	1.0	4	.7	2	.8	1	.4	9	.5
Employees			629	.6			278	.4	70	.04	73	.6	24	.1	23	.1	270	.4	888	1.8	158	1.1	69	.3			2033	3.5	30577	13.6	5763	5.5	515	.4	2932	2.6	30	.04	4	.02	39	.1
Butler																																										
Establishments			92	1.2					2	.01	10	.9	3	.5	1	.3	13	.6	9	1.4	6	4.1	4	1.3	1	.4	25	2.5	9	1.5	16	1.0	21	1.2	2	.4	1	.4	2	.8	2	.3
Employees			293	.2					329	.2	55	.4	128	.5	37	.1	180	.3	598	1.2	898	5.8	413	1.6	46	.1	1370	2.3	4439	2.0	576	.6	1014	.8	347	.3	2295	3.0	226	.8	97	.3
Fayette																																										
Establishments			33	1.2	1	1.3	3	.4	6	.3	42	3.8	3	1.6	1	.3	13	.6	6	1.0	2	1.4					17	1.7	7	1.2	18	1.0	19	1.1	1	.2	4	1.6	1	.4	5	1.0
Employees			659	.6	18	.2	201	.3	1221	.7	677	5.4	55	.2	99	.2	271	.4	324	.7	30	.2					1907	3.2	187	.1	1132	1.1	372	.3	36	.03	782	1.0	282	1.0	8	.09
Greene																																										
Establishments			13	.5					2	.1	2	.2					4	.2							1	.4	3	.3	1	.2	2	.1	3	.2								
Employees			142	.1					358	.2	21	.2					39	.1							100	.3	30	.05	33	.02	29	.03	6	.01								
Indiana																																										
Establishments	1	5.3	11	.2					4	.2	13	1.2	1	.2			10	.6	1	.2	1	.7	1	.3	1	.4	7	.7	4	.7	9	.5	5	.3	1	.2			2	.8	1	.2
Employees	140	2.9	228	.2					681	.4	56	.4	229	.9			128	.2	6	.01	6	.04	360	1.4	122	.3	186	.3	82	.04	657	.6	680	.6	11	.01			818	3.0	1	.03
Washington																																										
Establishments			55	2.0					4	.2	11	1.0	13	2.3	5	1.3	27	1.2	4	6	2	1.4	6	1.9			31	3.1	15	2.6	27	1.6	30	1.7	4	.7	2	.8	2	.8	3	.6
Employees			584	.5					640	.3	133	1.1	140	.5	529	1.3	329	.5	235	5	14	.1	144	.6			3924	6.7	6629	3.0	1295	1.2	778	.6	2922	2.5	28	.04	83	.3	61	.2

aPercent Pennsylvania total.

bData not available, missing.

Source: Adapted from data provided by the Department of Internal Affairs, Commonwealth of Pennsylvania.

Table D-2. Distribution of Manufacturing Industries and Manufacturing Employment by Region in Pennsylvania in 1964 (cont.)

Standard Industrial Classification (SIC) Number

County	19		20		21		22		23		24		25	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Westmoreland Establishments	1	5.3	89	3.2					17	.8	30	2.7	11	1.9
Employees	5	.1	1046	.8					1059	.6	346	2.8	78	.3
Region 12 Totals Establishments	2	10.6	584	21	3	3.8	5	0.6	99	4.51	153	13.9	90	16.6
Employees	145	2.4	20123	17	21	.22	491	.72	5420	3.14	1891	15.1	2050	7.9
Crawford Establishments			20	.7			3	.4			38	3.4	1	.2
Employees			440	.4			32	.04			270	2.2	27	.1
Erie Establishments			61	2.2			1	.3	8	.4	26	2.3	13	2.3
Employees			2060	1.7			139	.2	213	.1	287	2.3	1305	6.0
Forest Establishments											3	.3		
Employees											132	1.1		
Lawrence Establishments	1	5.3	30	1.1			1	.1	1	.1	5	.5	2	.3
Employees	196	3.2	414	.2			95	.1	164	.1	39	.3	14	.1
Mercer Establishments			38	1.4					3	.1	29	2.6		
Employees			652	.6					63	.03	190	1.5		
Venango Establishments			8	.3							28	2.5	1	.2
Employees			98	.002							204	1.6	2	.1
Warren Establishments			7	.3							23	2.1	5	.9
Employees			236	.2							321	2.6	299	1.2
Region 13 Totals Establishments	1	5.3	164	6.0			5	0.8	12	0.6	151	13.5	22	3.9
Employees	196	3.2	3890	3.1			260	.34	440	.23	1443	11.6	1647	6.5
State Establishments	19		2765		78		788		2137		1105		574	
Employees	6134		117614		11393		72042		179918		12491		25814	
Establishments														
Employees														
Establishments														
Employees														
Establishments														
Employees														
Establishments														
Employees														
Establishments														
Employees														
Establishments														
Employees														

County	26		27		28		29		30		31		32	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Westmoreland Establishments	4	1.0	53	2.4	8	1.3	4	2.7	6	1.7			44	4.4
Employees	767	1.8	795	1.3	226	.5	301	2.1	1091	4.2			4783	8.2
Region 12 Totals Establishments	34	8.9	449	20.2	114	18.2	39	27.3	43	13.7	11	4.5	283	28.2
Employees	3653	8.8	8474	13.4	6246	12.9	1666	12.9	4127	16.1	344	0.9	23907	40.6
Crawford Establishments			8	.4	3	.5			7	2.2	2	.8	7	.7
Employees			209	.3	1570	3.2			471	1.8	142	.4	52	.09
Erie Establishments	4	1.0	45	2.0	9	1.4	4	2.7	23	7.3	1	.4	12	1.2
Employees	2138	5.1	888	1.4	245	.5	144	1.0	3118	12.2	93	.2	181	.3
Forest Establishments			1	.05			1	.7	1	.3			2	.2
Employees			3	.01			6	.04	120	.5			310	.5
Lawrence Establishments	1	.3	12	.5	6	1.0	4	2.7	3	1.0	1	.4	21	2.1
Employees	3	.01	195	.3	277	.6	10	.3	153	.6	230	.6	2443	4.2
Mercer Establishments	1	.3	13	.6	3	.5	1	.7	3	1.0			11	1.1
Employees	30	.1	293	.4	48	.1	8	.06	38	.1			300	.5
Venango Establishments	1	.3	9	.4	3	.5	8	5.5	2	.6			3	.3
Employees	84	.2	273	.4	81	.2	951	6.5	74	.3			425	.7
Warren Establishments			6	.3	2	.3	3	2.1	2	.6			5	.5
Employees			192	.3	29	.06	269	1.9	83	.3			113	.2
Region 13 Totals Establishments	7	1.9	94	4.3	26	4.2	21	14.4	41	13	4	1.6	61	6.1
Employees	2255	5.4	1993	3.1	2250	4.7	1418	9.8	4052	15.8	465	1.2	3824	6.5
State Establishments	385		2238		624		146		313		239		1009	
Employees	41652		63015		48269		14540		25657		33352		58552	
Establishments														
Employees														
Establishments														
Employees														
Establishments														
Employees														
Establishments														
Employees														
Establishments														
Employees														
Establishments														
Employees														

County	33		34		35		36		37		38		39	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Westmoreland Establishments	44	7.5	43	2.5	60	3.5	19	3.4	5	2.0	3	1.2	8	1.4
Employees	16826	7.5	4102	4.0	3906	3.4	3691	3.1	332	.4	1138	4.1	88	.3
Region 12 Totals Establishments	181	31	381	22	334	19.3	73	13	31	12.4	41	16.2	83	14.3
Employees	120852	53.9	27166	26	17489	14.8	28457	24	11192	14.6	4962	18.0	3032	10.3
Crawford Establishments	9	1.5	11	.6	29	1.7	3	.5			1	.4	5	1.0
Employees	1746	.8	638	.6	896	.8	315	.3			24	.1	2043	7.0
Erie Establishments	25	4.3	75	4.3	92	5.3	22	3.9	9	3.6	8	3.2	20	3.4
Employees	4055	1.8	5132	5.0	4184	3.6	4926	4.1	5694	7.5	2690	9.7	2707	9.2
Forest Establishments	1	.2			1	.1								
Employees	16	.01			7	.01								
Lawrence Establishments	8	1.4	19	1.1	19	1.1	2	.4	2	.8	2	.8	1	.2
Employees	2772	1.2	1161	1.1	3471	3.0	15	.01	444	.6	45	.2	5	.02
Mercer Establishments	14	2.4	20	1.1	10	.6	4	.7	2	.8	2	.8	2	.3
Employees	8990	4.0	1408	1.3	2231	2.0	4960	4.2	1154	1.6	88	.3	453	1.5
Venango Establishments	6	1.0	5	.3	18	1.1	2	.4	6	2.4	1	.4		
Employees	684	.3	312	.3	3077	2.6	261	.2	91	.1	30	.1		
Warren Establishments	2	.3	9	.5	10	.6	7	1.2	4	1.6			1	.2
Employees	2208	1.0	1213	1.2	192	.2	495	.4	117	.2			22	.1
Region 13 Totals Establishments	65	11.1	139	7.9	179	10.5	40	7.1	23	9.2	14	5.6	29	5.1
Employees	20471	9.1	9804	9.5	14058	12.1	10972	9.2	7500	9.9	2877	10.4	5230	12.8
State Establishments	584		1733		1721		566		251		253		587	
Employees	224863		104687		116395		119110		76102		27553		27486	
Establishments														
Employees														
Establishments														
Employees														
Establishments														
Employees														
Establishments														
Employees														
Establishments														
Employees														
Establishments														
Employees														

Percent Pennsylvania total.
Data not available, missing.
Source: Adapted from data provided by the Department of Internal Affairs, Commonwealth of Pennsylvania.

Table D-3. Industrial Development Announcements by Region and Industry Type, 1964 through 1966

County Code	Year	Floor Space (1000s of square feet)*		Number of employees †		Number of Companies by Industry Type Announcing New Industrial Development Projects ‡																					
		Total	Average	Total	Average	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	Total
Bucks	1964	1244	46	2080	77					2				1	2		4		1	3	2	5	2	2		3	27
	1965	1251	40	2159	70					4	1	1	4	2	1		1			2	5	4	4	2			31
	1966	1544	39	3051	76					4			6		3		4		2		6	3	5	4		3	40
	Total	4039		7290						10	1	1	10	3	6		9		3	5	13	12	11	8		6	98
Chester	1964	392	30	1115	86		2		1	1							2			1	1		2	2		1	13
	1965	466	42	1085	99					1					2	1	2		2	1	1		1				11
	1966	759		1947						2			2		4		1			1	1	3	2	3	4	1	24
	Total	1617		4147			2		1	4			2		6	1	5		2	3	3	3	5	5	4	2	48
Delaware	1964	599	50	472	39								3	1	1	1	2				2	1	1				12
	1965	563	47	781	65					1				1	1		2	1				1	2	2		1	12
	1966	291	41	460	66				2				1								2			1	1		7
	Total	1453		1716					2	1			4	2	2	1	4	1			4	2	3	3	1	1	31
Montgomery	1964	2098	66	4565	143		1		1	2	1	2	2	1	2		2			4	3	3	4	1	3		32
	1965	2336	38	4118	68		4			2		3	3		4		3	1	2	4	7	9	11	5	2	1	61
	1966	1527	36	2217	53	1	3			3			2	2	4		2		1	3	6	3	4	3	5		42
	Total	5961		10900		1	8		1	7	1	5	7	3	10		7	1	3	11	16	15	19	9	10	1	135
Philadelphia	1964	3582	42	4291	50		10		4	23		5	6	4	2		4				10	5	7		2	4	86
	1965	5554	59	7375	18		11			22		4	9	11	4	1	2	1			14	3	6	3	2	1	94
	1966	3652	51	4285	60		8		4	16		2	6	7	4		2		1	1	10	2	4			4	71
	Total	12788		15951			29		8	61		11	21	22	10	1	8	1	1	1	34	10	17	3	4	9	251
Region 1	Total	25358		40004		1	39		12	83	2	17	44	30	34	2	33	3	9	20	70	42	55	28	19	19	563
Berks	1964	263	19	879	59		1			4		1						1	1	1		1	2	1		1	14
	1965	768	27	1571	56				2	9	1	1		1			3			4	2		2	3			28
	1966	980	41	871	36		2		2	6			2		3					3	5	1					24
	Total	2011		3261			3		4	19	1	2	2	1	3		3	1	1	8	7	2	4	4		1	66
Lehigh	1964	917	32	1908	66		3		6	7			2	1			2			2	5	1					29
	1965	967	37	1445	56		1	1	2	2	1					1			1	1	2	1	2	1			26
	1966	560	24	1267	55		1		2	8					1	2		1				5	1	1		1	23
	Total	2444		4620			5	1	10	27	1		2	1	1	3	2	1	1	3	7	7	3	2		1	78
Northampton	1964	761	55	1184	85					5			2				1			2	2	1		1			14
	1965	569	26	821	27					9				2	1		2				3	2	3				22
	1966	956	38	1270	51				1	11			1	1	3		1				1	1	3	1		1	25
	Total	2294		3275					1	25			3	3	4		4			2	6	4	6	2		1	61
Region 2	Total	6749		11156			8	1	15	[illegible]	2	2	7	5	8	3	9	2	2	13	20	13	13	8		3	205

Source: Compiled from data provided by the Department of Commerce, Commonwealth of Pennsylvania.

*To be occupied.

†To be added.

‡ By Standard Industrial Classification Number of the office of Statistical Standards, U.S. Bureau of the Budget.

Table D-3. *Industrial Development Announcements by Region and Industry Type, 1964 through 1966 (Continued)*

County Code	Year	Floor space (1000s of square feet)*		Number of employees †		Number of Companies by Industry Type Announcing New Industrial Development Projects ‡																					
		Total	Average	Total	Average	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	Total
Monroe	1964	47	9	164	33				1							2					2						5
	1965	219	24	362	40					4	2	1			1							1					9
	1966	269	34	457	57				1	3							1				1	1			1		8
	Total	535		983					2	7	2	1			1	2	1				3	2			1		22
Pike	1964																										
	1965																										
	1966	24	12	85	42					1														1			2
	Total	24		85						1														1			2
Wayne	1964	118	24	242	48				1	1			1			2											5
	1965																										
	1966	131	26	462	92					2		1					1						1				5
	Total	249		704					1	3		1	1			2	1						1				10
Region 3	Total	808		1772					3	11	2	2	1		1	4	2				3	2	1	1	1		34
Bradford	1964	89	30	169	56				1				1													1	3
	1965	89	15	581	97					2		1								1			1		1		6
	1966	362	45	623	78					2			1					1				1	1		1	1	8
	Total	540		1373					1	4		1	2					1		1		1	2		2	2	17
Sullivan	1964	20	20	100	100					1																	1
	1965	6	6	20	20					1																	1
	1966																										
	Total	26		120						2																	2
Susquehanna	1964	13	6	33	16					1							1										2
	1965	17	8	30	15						1							1									2
	1966	30	30	129	129													1									1
	Total	60		192						1	1						1	2									5
Tioga	1964	28	14	45	22		1				1																2
	1965	31	16	157	78						1												1				2
	1966	29	14	325	162					1													1				2
	Total	88		527			1			1	2												2				6
Wyoming	1964																										
	1965	3	3	30	30				1																		1
	1966	57	19	195	65					2								1									3
	Total	60		225					1	2								1									4
Region 4	Total	774		2437			1		2	10	3	1	2				1	4		1		1	4		2	2	34

Source: D-3. Adapted from data provided by the Department of Commerce, Commonwealth of Pennsylvania.

*To be occupied.

†To be added.

‡ By Standard Industrial Classification Number of the office of Statistical Standards, U.S. Bureau of the Budget.

Table D-3. Industrial Development Announcements by Region and Industry Type, 1964 through 1966 (Continued)

County Code	Year	Floor space (1000s of square feet)*		Number of employees †		Number of Companies by Industry Type Announcing New Industrial Development Projects ‡																					
		Total	Average	Total	Average	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	Total
Carbon	1964	13	3	135	34					3		1															4
	1965	26	6	135	34				1	2											1						4
	1966	76	13	329	55				2	2													1			1	6
	Total	115		599					3	7		1									1		1			1	14
Lackawanna	1964	1237	33	2544	69		3		1	17	1			1	1		3				5	1	1	1	1	2	37
	1965	355	15	991	41		2			14		1					1				3		2	1			24
	1966	1284	46	2577	92		2			10	1			2	2		3			2		1	1	2		2	28
	Total	2876		6112			7		1	41	2	1		3	3		7			2	8	2	4	4	1	4	89
Luzerne	1964	1755	34	4802	92			2	8	19		2	1	1			4	1	2		7			4		1	52
	1965	1485	34	4565	104		2		1	20	2	4	1		1			1	1		3	1	1	4		2	44
	1966	2116	41	4663	91		1		3	25	1			1	4		1	1	1	1	1	5	1	2	1	2	51
	Total	5356		14030			3	2	12	64	3	6	2	2	5		5	3	4	1	11	6	2	10	1	5	147
Schuylkill	1964	664	39	1157	68		1	1	1	6		1					2		1		1					3	17
	1965	353	25	1091	78					6		1	1				2				1	2		1			14
	1966	1096	39	2164	77	1	1		3	8			1		1		1		1		3	2	3	2		1	28
	Total	2113		4412		1	2	1	4	20		2	2		1		5		2		5	4	3	3		4	59
Region 5	Total	10460		25153		1	12	3	20	132	5	10	4	5	9		17	3	6	4	24	13	9	17	1	14	309
Adams	1964	14	7	45	23					1												1					
	1965	78	11	332	47		1			4		1						1									7
	1966	19	10	70	35															1			1				2
	Total	111		447			1			5		1						1		1		1	1				11
Cumberland	1964	239	24	605	61		1		1	3					1		1				2		1				10
	1965	339	26	588	45		2			1	1		1			1		1	1		2	2	1				13
	1966	234	39	702	117		1												2			1		2			6
	Total	812		1895			4		1	4	1		1		1	1	1	1	3		4	3	2	2			29
Dauphin	1964	159	40	193	48		1			2																1	4
	1965	109	16	342	49					2								2			2		1				7
	1966	742	124	2743	457					1								2				1		2			6
	Total	1010		3278			1			5								4			2	1	1	2		1	17
Franklin	1964	243	35	957	137		1		1	1			1										1	1		1	7
	1965	199	33	165	27		1			1									1		2	1					6
	1966	116	29	290	72					2			1									1					4
	Total	558		1412			2		1	4			2						1		2	2	1	1		1	17

Source: [illegible] from data provided by the Department of Commerce, Commonwealth of Pennsylvania.

*To be occupied.

†To be added.

‡ By Standard Industrial Classification Number of the office of Statistical Standards, U.S. Bureau of the Budget.

Table D-3. *Industrial Development Announcements by Region and Industry Type, 1964 through 1966 (Continued)*

County Code	Year	Floor Space (1000s of square feet)*		Number of employees †		Number of Companies by Industry Type Announcing New Industrial Development Projects ‡																					
		Total	Average	Total	Average	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	Total
Lancaster	1964	775	29	1540	59		4	2	1	5		1	2					1	3	2	1	1	1			1	26
	1965	611	32	1275	67	1				2			2						1	3	3	3	2	2			19
	1966	1261	41	2291	74					5	2	✓	1	1	1	1	1		1	2	7	5	1	1		1	31
	Total	2647		5106		1	4	2	1	12	2	2	5	1	1	1	1	1	5	7	11	9	4	3		2	76
Lebanon	1964	160	40	310	78					1			1					1		1							4
	1965	747	68	636	58		1			4								2		1	1	1		1			11
	1966	156	17	362	40					4						1		1	2					1			9
	Total	1063		1308			1			9			1			1		4	2	2	1	1		2			24
Perry	1964	32	16	92	46					1				1													2
	1965																										
	1966	10	10	34	34					1																	1
	Total	42		126						2				1													3
York	1964	2430	84	4242	146		6	1	2	4			4	1			1	1	2	1	1	1	1	1		1	28
	1965	1229	437	1624	62	1			3	4	2		2	2	1					1	3	1	4			2	26
	1966	2021	67	2773	93		1			5		1	1	2	1				1	1	7	7	1		2		30
	Total	5680		8639		1	7	1	5	13	2	1	7	5	2		1	1	3	3	11	9	6	1	2	3	84
Region 6	Total	11923		22211		2	20	3	8	54	5	4	16	7	4	3	3	12	14	13	31	26	15	11	3	7	261
Columbia	1964	369	34	571	52	1	2		2	3				1										1		1	11
	1965	501	56	582	65	1			1	1		1	1								1			2	1		9
	1966	463	38	760	63		2			4	1										1		2	2			12
	Total	1333		1923		2	4		3	8	1	1	1	1							2		2	5	1	1	32
Juniata	1964	8	8	30	30					1																	1
	1965																										
	1966	15	15	35	35					1																	1
	Total	23		65						2																	2
Mifflin	1964																										
	1965	327	107	440	147							1				1							1				3
	1966		44	175	88																1		1				2
	Total	415		615								1				1					1		2				5
Montour	1964	8	8	20	20																	1					1
	1965	18	18	60	60					1																	1
	1966	126	32	306	76					1										1			1	1			4
	Total	152		386						2										1		1	1	1			6

Source: D-3. Adapted from data provided by the Department of Commerce, Commonwealth of Pennsylvania.

*To be occupied.

†To be added.

‡ By Standard Industrial Classification Number of the office of Statistical Standards U.S. Bureau of the Budget.

Table D-3. *Industrial Development Announcements by Region and Industry Type, 1964 through 1966*

County Code	Year	Floor Space (1000s of square feet)*		Number of employees †		Number of Companies by Industry Type Announcing New Industrial Development Projects ǂ																					
		Total	Average	Total	Average	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	[illegible]
[illegible]	[illegible]	[illegible]																									
	1966	128	[illegible]	[illegible]	107													1		1	1						[illegible]
	Total	3094		332			2		2			3			1	1		2		2	4		1				[illegible]
Snyder	1964	95	32	100	33							1										1		1			3
	1965	137	14	468	47		1		1	3		2										1	1	1			10
	1966	49	16	82	27					2												1					3
	Total	281		650			1		1	5		3										3	1	2			16
Union	1964	15	15	8	8															1							1
	1965	20	20	30	30					1																	1
	1966	15	15	12	12																					1	1
	Total	50		50						1										1						1	3
Region 7	Total	5348		5621		2	9			25	2	3	1	1	1	2		2		4	10	3	6	9	2	3	
Centre	1964	117	29	561	140			2												1		1					4
	1965	64	7	146	16		1					1						1		1	1	4					9
	1966	519	65	762	95									1				3	1		1	2					8
	Total	700		1469			1	2				1		1				4	1	2	2						21
Clinton	1964	177	89	155	78					1														1			2
	1965	132	33	225	56								1		1				1					1			4
	1966	146	73	420	210					1														1			2
	Total	455		800						2			1		1				1					3			8
Lycoming	1964	437	34	549	42				2	2		1				1	1				5					1	13
	1965	619	52	1189	99			1	1	1	4			1		1				2	1						12
	1966	409	29	654	47				1			1			2			1	1	2	3	1	1	1			14
	Total	1465		2392				1	4	3	4	2		1	2	2	1	1	1	4	9	1	1	1		1	39
Region 8	Total	2620		4661			1	3	4	5	4	3	1	2	3	2	1	1	6	5	11	3	8	4		1	68
Cameron	1964	33	17	85	43															1			1				2
	1965	26	7	90	30							1								2							3
	1966	40	20	120	60							1													1		2
	Total	99		295								2								3			1		1		7
Elk	1964	246	41	235	39						1									3		1		1			6
	1965	145	24	136	23													1		2		3					6
	1966	361	180	460	230																	1			1		2
	Total	752		831							1							1		5		5		1	1		14

Source: Adapted from data provided by the Department of Commerce, Commonwealth of Pennsylvania.

*To be occupied.

† To be added.

ǂ By Standard Industrial Classification Number of the Office of Statistical Standards, U.S. Bureau of the Budget.

Table D-3. Industrial Development Announcements by Region and Industry Type, 1964 through 1966 (Continued)

County Code	Year	Floor Space (1000s of square feet)*		Number of employees †		Number of Companies by Industry Type Announcing New Industrial Development Projects ‡																					
		Total	Average	Total	Average	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	Total
Cameron	1964	33	17	85	43															1			1				2
	1965	26	9	90	30							1								2							3
	1966	40	20	120	60							1													1		2
	Total	99		295								2								3			1		1		7
McKean	1964	105	17	116	19							1			2						1		1			1	6
	1965	112	16	110	16						1			1		1			1				1			2	7
	1966	169	28	444	74						1								2				1		1	1	6
	Total	386		670							2	1		1	2	1			3		1		3		1	4	19
Potter	1964	8	8	50	50																		1				1
	1965	18	18	50	50														1								1
	1966	7	7	15	15																	1					1
	Total	33		115															1			1	1				3
Region 9	Total	1270		1911							3	3		1	2	1		1	4	8	1	6	5	1	3	4	43
Clarion	1964	66	33	68	34																		1	1			2
	1965	8206	8206	70	70							1															1
	1966	45	22	63	32		1					1															2
	Total	8280		208			1					2											1	1			5
Clearfield	1964	157	39	134	34					1	1										1					1	4
	1965	279	23	949	79					3								1	3		1		3			1	12
	1966	84	21	110	28		1												1		1				1		4
	Total	520		1193			1			4	1							1	4		3		3		1	2	20
Jefferson	1964	220	37	115	19		1								1	1		1			1			1			6
	1965	93	37	295	98													1	1				1				3
	1966	98	14	177	25													1				2		4			7
	Total	411		587			1								1	1		3	1		1	2	1	5			16
Region 10	Total	9211		1988			3			4	1	2			1	1		4	5		4	2	5	6	1	2	41
Bedford	1964	3	3	10	10							1															1
	1965	380	76	500	100					1	2	1	1														5
	1966	10	10	60	60																1						1
	Total	393		570						1	2	2	1								1						7
Blair	1964	343	26	1228	94		2			2			3					1	1				2	1		1	13
	1965	827	69	1695	141					2			2					2	1		1	1	1	2			12
	1966	407	45	831	92					2			2		1		1			1				1	1		9
	Total	1577		3754			2			6			7		1		1	3	2	1	1	1	3	4	1	1	34

Source: D-3. Adapted from data provided by the Department of Commerce, Commonwealth of Pennsylvania.

*To be occupied.

†To be added.

‡ By Standard Industrial Classification Number of the office of Statistical Standards, U.S. Bureau of the Budget.

Industrial Development Announcements by Region and Industry Type, 1964 through 1966 (Continued)

County Code	Year	Floor space (1000s of square feet)*		Number of employees †		Number of Concerns by Industry Type Announcing New Industrial Development Projects †																					
		Total	Average	Total	Average	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	Total
Cambria	1964	270	45	928	55					1						1	1	1		1	1						6
	1965	306	38	410	51														1	1							2
	1966	200	20	366	37										2			1	1	1	2		1				10
	Total	776		706											2	1	1	2	2	3	3		1				[illegible]
Fulton	Total																										
	1964	6	6	10	10														1								
	1965																										
	1966	14	14	75	75																1						1
	Total	20		85															1		1						2
Huntingdon	1964	67	35	515	258					1							1										2
	1965	310	62	520	104								1					2					2				[illegible]
	1966																										
	Total	[illegible]		1035													1	2									
Somerset	1964	660	73	485	54					4		2			1	1											[illegible]
	1965	149	25	325	54		1														1	1					[illegible]
	1966	506	127	1059	265					1		1											1	1			[illegible]
	Total	1315		1869						6		3			1	1	1				1	1	3	1			19
Region II	Total	4464		9014			3			20	3	5	10		4	2	4	7	5	4	7	2	9	5	1	2	93
Allegheny	1964	1804	41	1307	41		3					3			7				5	3	6	3	4			3	[illegible]
	1965	1083	24	2219	60		2					5			2			1	2	4	7		3	2		1	[illegible]
	1966	[illegible]	43	1933	44																						
	Total	[illegible]		[illegible]																							
[illegible]	[illegible]	[illegible]	16	[illegible]	[illegible]																						
	[illegible]	[illegible]	46	[illegible]	[illegible]																						
	1966	[illegible]	34	392	35																						
	Total	371		773																1					1		15
Beaver	1964	312	35	258	29										2					3				2			[illegible]
	1965	563	70	330	04														2							1	[illegible]
	1966	177	39	[illegible]	[illegible]															1	1						[illegible]
	Total	1052		[illegible]															3	6	2		1	2		1	19

Source: [illegible]

* [illegible] by Standard Industrial Classification Number of the Office of Statistical Standards,

† To be adjusted [illegible] U.S. Bureau of the Budget.

Table D-3. *Industrial Development Announcements by Region and Industry Type, 1964 through 1966 (Continued)*

County Code	Year	Floor Space (1000s of square feet)*		Number of employees †		Number of Companies by Industry Type Announcing New Industrial Development Projects ‡																					
		Total	Average	Total	Average	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	Total
Fayette	1964	148	18	309	39					1	1								1		2	1		1		1	8
	1965	132	16	300	38						1						1		3	1	1	1					8
	1966	401	40	1020	102					2	1								1		2		1	3			10
	Total	681		1629						3	3						1		5	1	5	2	1	4		1	26
Greene	1964	94	47	270	135					1										1							2
	1965	22	22	60	60									1													1
	1966	38	38	100	100																			1			1
	Total	154		430						1				1						1				1			4
Indiana	1964	608	76	475	59		1		1							1	1		1		2	1					8
	1965	161	23	353	50		1			2												3	1				7
	1966	73	15	115	23				1												3		1				5
	Total	842		943			2		2	2						1	1		1		5	4	2				20
Washington	1964	150	11	554	40		1			2		1			2	1			2	3	1					1	14
	1965	267	19	333	24		1			2					1				1	2	1	5	1				14
	1966	397	26	758	51					1									2	1	5	4	2				15
	Total	814		1645			2			5		1			3	1			5	6	7	9	3			1	43
Westmoreland	1964	676	19	1068	31		5			3	1		1		2	1	3		2	3	6	3	3	1	1		35
	1965	595	21	1186	41		1			3		2	2	1	1				4	1	5	5	1	2		1	29
	1966	728	26	1422	51		1			4			3	1			1		1	5	3	4	1		2	2	28
	Total	1999		3676			7			10	1	2	6	2	3	1	4		7	9	14	12	5	3	3	3	92
Region 12	Total	11093		18346			18		4	22	4	12	8	4	26	4	9	1	33	38	65	50	28	13	7	14	360
Crawford	1964	616	68	875	97												1				4	1	1	2			9
	1965	139	13	150	14												2				2	7					11
	1966	650	54	1294	108										1				1	1	1	3	2		3		12
	Total	1405		2319											1		3		1	1	7	11	3	2	3		32
Erie	1964	379	22	573	34		1								1		4			4	3	2		1		1	17
	1965	1740	45	3941	104		1			2		1			1		5			5	6	7	6	3		1	38
	1966	937	36	1191	46		1					2		1		1	6			3	3	3	3		2	1	26
	Total	3056		5705			3			2		3		1	2	1	15			12	12	12	9	4	2	3	81
Forest	1964	17	17	31	31												1										1
	1965																										
	1966																										
	Total	17		31													1										1

Source: D-3. Adapted from data provided by the Department of Commerce, Commonwealth of Pennsylvania.

*To be occupied.

†To be added.

‡ By Standard Industrial Classification Number of the office of Statistical Standards, U.S. Bureau of the Budget.

Table D-6. Industrial Development Announcements by Region and Industry Type, 1964 through 1966 (Continued)

Unit Code	Year	Floor Space (1000s of Square Feet)* Total	Floor Space (1000s of Square Feet)* Manuf.	New Employees† Total	New Employees† [illegible]	Number of Companies by Industry Type Announcing New Industrial Development Projects‡ 19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	Total
Lawrence	1964	[illegible]	39	[illegible]	[illegible]												1		1								4
	1965	[illegible]	[illegible]	82	[illegible]											1	1	1	2		1					1	[illegible]
	1966	113	16	[illegible]	[illegible]														1	1	1	1					
	Total	335		114			3				1		2			1	2	1	4	1	2	2		2		2	4
Mercer	1964	257	29	[illegible]	[illegible]										1	2				1	3				1		
	1965	222	18	245	45						3						1	1	1	2			1				
	1966	[illegible]	13	67	22															1	2						
	Total	[illegible]		[illegible]			1				3			1	1	3	1	1	1	4	2	1	1		1		24
Venango	1964	[illegible]	52	[illegible]	41						1					1			1		2						
	1965	[illegible]	29	[illegible]	44														2			1					
	1966	235	59	[illegible]	78										1							3					4
	Total	[illegible]		[illegible]									1		2	1			2		2						
Warren	1964	[illegible]	20	151	38							1				1							1				4
	1965	44	16	175	58																1		1				3
	1966	217	54	350	88							1										2			1		4
	Total	348		676								2				1					1	3	2		1		11
Region 13	Total	6511		11498			7			3	4		3	2	6	6	22	2	9	18	29	33	15	1	7	6	188
Pennsylvania	Total	96,674		156,162		6	170	10	[illegible]	1440	40	73	97	57	99	30	101	42	73	128	274	145	17[illegible]	114	47	77	2284
	1964																										
	1965																										
	1966																										
	Total																										
	1964																										
	1965																										
	1966																										
	Total																										

Source: Compiled from data provided by the Department of Commerce, Commonwealth of Pennsylvania.

*To be occupied.

†To be added.

‡ By Standard Industrial Classification Number of the Office of Statistical Standards, U.S. Bureau of the Budget.

REGION 1

Region 1 is the most urban of Pennsylvania's 13 regions, containing the City of Philadelphia and its satellite communities. Region 1, like most urban areas of the United States, is undergoing an upheaval as the nature of its economic base shifts and as residents keep pushing its urban boundaries outward.

Region 1 is still a manufacturing leader. In 1960, 37% of its employees, about the same as the proportion for the State, worked in manufacturing, but the situation is changing. In the 1952-1962 decade, for example, the City of Philadelphia lost 63,000 manufacturing jobs while the remainder of the Region gained less than a quarter of the number lost by Philadelphia. Primary reasons for the downward shift in the relative importance of manufacturing industry in Philadelphia include: (1) scarcity of land suitable for industrial expansion; (2) increasing tendency for city firms to establish branch plants in suburban areas; (3) expansion of industries which tend to be less labor intensive (*e.g.* printing and publishing); (4) increased concentration of slow-growth industries in Philadelphia; (5) a movement away from the city of "footloose" industries seeking amenity resources (*e.g.* research complexes); (6) the effect of increased productivity on labor requirements; and (7) the central city's expanding service industries, relative to growth in other sectors. Region 1 is, nevertheless, the Nation's fourth largest manufacturing center and is highly diversified (See Table D-2). Ninety per cent of the different kinds of products made in the U.S. are manufactured in this Region.

Since 1920, the Region's leading sources of employment have been deeply altered. Textiles and apparel have declined approximately 30% since 1920. By 1964, apparel was the source of 42,000 jobs and textiles 18,000. Several other employment sectors far surpassed textiles in 1964: food products, 29,000 jobs; electrical machinery, 23,000; printing, 26,000; and fabricated metals, 17,000 (See Table D-2). While the Region's garment industry, (SIC23), is not particularly thriving, it does show considerable activity, particularly in Philadelphia where 61 companies announced expansion or addition of new plants during the period 1964-66 (See Table D-3). However, the activity during the period is not particularly reason for optimism. In fact, there were only 16 announcements of intended new advances by companies in 1966 as compared to 22 and 23 in 1965 and 1964, respectively. This could be partly the result of the generally crowded and inefficient accesses for trucks to the garment manufacturing areas of Philadelphia.

New jobs are anticipated in non-manufacturing sectors; the increases are in line with nationwide trends in which more of the consumer dollar is going for services than for goods.

In 1960, approximately 21% (or 300,000) of the Region's work force was employed in service industries. The largest share of this employment, 55% (or 174,700) workers, was found in Philadelphia, while another 30% was located in Montgomery and Delaware Counties. The Region's proportion of service employment to total employment in 1960 was slightly higher than the State average.

One of the industries affecting Region 1 in an impressive way is research and development. Although employment in R & D cuts across other industry groups in 1965 there were estimated to be 425 laboratories in the Region, employing 30,000. R & D programs in recent years have been most closely identified with the aerospace industry. Medicine, electronics, instruments, machinery, materials, and physics are other areas of investigation and advancement.

Some contended that technological changes, rather than unfavorable urban conditions, has been the most important factor in the decline of manufacturing jobs in the city. Many small manufacturers can only survive within the city where they have speedy communication and transportation. In some manufacturing fields these considerations are so important that employment is very heavily concentrated within Philadelphia. Printing and publishing are examples of fields which find location advantage in the City.

Local and national economic forces have resulted in a drop in the Philadelphia unemployment rate from 8.6% in 1958 to 5.8% in 1964, and, more recently, to 3.3% in December 1965. Young people comprised a disproportionate large part of the unemployment because they lack skills and seniority. The part of the Philadelphia labor market,located across the Delaware River in metropolitan counties of New Jersey (Burlington, Camden and Gloucester Counties),has experienced, since 1958, more than twice the rate of growth in employment shown for the area as a whole. With its greater availability of large level potential industrial sites adjoining new freeways, this area's faster growth in employment may well continue and prove especially helpful to the nearby residents of Philadelphia.

Like Philadelphia, most of the seven urban centers in Region 1 have experienced a decline of manufacturing jobs since 1957. The availability of land for expansion with access to high-speed highways is often given as a reason for this phenomenon. Two areas which have attracted recent industrial growth are King of Prussia and Fort Washington, both located at important interchanges along the Turnpike. Counter trends have been observed in Bristol, Pottstown and Chester where loss of manufacturing jobs has been of even higher proportion than in Philadelphia. However, in the last two or three years each of these outlying communities have recovered some of the earlier losses, or at least stabilized their manufacturing employment.

To summarize, Region 1 has been experiencing relatively little growth in total employment in recent years (less than 5% between 1958 and 1964). However, since 1964 indications are that there has been a marked increase in employment. In the process of this pause in economic growth, a significant redistribution of industrial employment has been taking place within the Region. Substantial gains in manufacturing employment have occurred in suburban counties at the expense of large losses in Philadelphia (See Figure 3-3). Prominent activity in Region 1 was shown among fabricated metals (SIC33) and non-electrical machinery (SIC36). Montgomery County showed even greater activity for SIC36 than did Philadelphia, illustrating the previously mentioned shift to the suburbs. These losses in the manufacturing and non-manufacturing sector, have been only partially offset by growth in the service industries. Future regional growth may be handicapped by the imbalance of a growing labor scarcity in the suburban counties and continued relatively high unemployment within the Cities of Philadelphia and Chester.

The significance of shifting manufacturing to suburban areas is that those who live in the ghettos of Philadelphia would likely find difficulty in getting to work by public transportation, even if they could qualify for the new jobs. Most people who live in ghettos now are not well-suited to work in the service industries of Center City Philadelphia. Thus, the poverty cycle is reinforced when appropriate public transportation is not available for those who cannot afford an automobile.

REGION 2

Region 2 as a whole has ideal diversification with farming, manufacturing, mining and commerce all playing important roles. It is strategically located, with the Lehigh and Schuylkill Rivers traversing it.

Generally, the economy of Region 2 mirrors that of the State but with two particularly notable differences. The Region has not had to contend with the problems of the coal mining industry; secondly, manufacturing has consistently played a proportionately large role here, accounting for 49 per cent of total employment, as compared to 38 per cent of the State's employment.

In the last decade the area has become considerably more service- and trade oriented, closely paralleling the State's 25 per cent increase in service industry employment during the same period. Finance, Insurance, Real Estate, and Public Administration also showed rapid gains but remained below comparable State proportions of overall employment. In manufacturing, Bethlehem Steel employs over 20,000 workers, (nearly four and one half times as many as the next largest employer in the Region), most of whom live in Lehigh and Northampton Counties with the remainder living in Berks and the hard coal counties to the north. If the current expansion in employment at Bethlehem continues the overall net deficit in workers, commuting to jobs outside of the Region could be reversed. At present, the largest net outflow of commuters from the Region go to Montgomery and Bucks Counties, while the greatest net inflow of commuters into the Region come from Schuylkill and Carbon Counties.

During the 1950's, employment in finance, insurance, and real estate increased by 43 per cent compared with 29 per cent for the State, while services and public administration, though showing gains of 25 and 20 per cent respectively, trailed behind the State. The proportional gains in employment in these three categories far outdistanced gains in the other major industries of Region 2. Though manufacturing employment grew by 3 per cent in the Region (compared to the State's 9.5 per cent increase), it appears certain that the location of these jobs was outside the Region and that this increase in employment represents entirely an increase in commuting out of Region 2 into the Philadelphia area.

Between 1951 and 1963, the number of manufacturing jobs in Region 2 declined by nearly 5 per cent (17,224). The loss of nearly 13,000 jobs in textile products and gain of over 6,000 jobs in electrical machinery (both largely female employing) illustrated a long-term regional trend in the upgrading of manufacturing employment opportunities, since textiles are typically a low-wage industry paying average wages of less than $5,000, while electrical machinery falls within the medium-wage range of $5,000-$6,000. Unfortunately for Region 2, the loss of jobs in the former has been twice as great as the gain in the latter. The loss of nearly 10,000 other jobs in primary metals (largely steel) has been responsible for the decline in proportions of high-wage jobs with a particular impact upon Northampton County. Diversification of the economic base of this area is needed to soften the impact of the severe cycles of employment and lay-offs frequently experienced in the steel industry. The apparel industry is the largest single employer, and in 1964 it provided 13.7 per cent of Pennsylvania's total emplovment in this industry (See Table D-2). Presently Region 2 appears to be experiencing strong growth in the apparel industry. Apparel manufacturers are fleeing New York City and Philadelphia to this Region. The most probable reason for this is the Region's winning combination of available labor and easy access by truck.

Fabricated metal products also appear strong. There are good markets in Philadelphia but access via U.S. 422 is not scheduled to be improved in The Six-Year Highway Program. On the other hand, highway improvements are planned for the Northeast Extension of the Turnpike and the New York ex-exchange which is advantageous to Region 2.

In Region 2, industrial site surveys have been carried out cooperatively by the local chambers, industrial corporations, and utility companies. The Greater Berks Development Fund also owns a tract of 230 acres which will be bisected by the limited-acess highway Route I-176. An interchange will provide access to this highway from the industrial tract.

At the moment, the vast majority of Berks County's manufacturing industries are still concentrated in and around the Reading urban area. Local industrial development leaders expressed the belief that the most promising opportunities for decentralized industrial growth were to be found in the Morgantown area in southern Berks and the Hamburg area of northern Berks. Public water supply and direct access to Interstate Freeways are available in both these communities.

Representatives of the two local utility companies have expressed the need for continued development of the highway network, particularly on the North-South axis which has not been developed as well as the East-West axis. There was also a general feeling in Region 2 that 75% of the future industrial growth would come from expansion of existing industry. This view was particularly strong in Berks County, where 19 industrial announcements of industry type 23 were made between 1964 and 1966, (See Table D-3). In 1964 apparel and related products was the second largest employer but accounted for only 2.7% of the State total in this industry type. Clearly, growth will accompany expansion of this industry, (See Table D-2).

The dominant long term objective of county planning in Region 2 is that of encouraging future residential, industrial and commercial development to locate within existing urban areas where services already exist or can easily be extended, and to minimize current trends towards decentralized scatteration of urban functions over the adjoining countryside.

REGION 3

Employment in the manufacturing sector has been expanding but remains a relatively small proportion of employment in all industries. The area's major manufactured products are fabricated metals, apparel and printing and publishing (See Table D-2 and D-3). Monroe County shows most of the industrial activity in the Region with focus on Stroudsburg, the action point on U.S. 80 (See Figure 3-2b). Accordingly, the proximity to New York markets will be responsible for activating the industrial potential of the area. Tourism was also the most significant economic activity in Monroe's employment in selected service industries in 1963. Projections of growth based on the impact of the Tocks Island project indicate that by 1985, Monroe County may have a year-round population of 85,000 and a summer population of 130,000. Although Pike and Wayne Counties will be mainly recreational areas, not dependent on manufacturing, they,nonetheless, may gain some manufacturing enterprises when roads are improved. The Region will hopefully gain the reputation as a nice place to live and a nice place to work.

New Interstate Highways, two of which cross the Region, will alter the present trends in population distribution. The impact of these new highways will open up many formerly inaccessible areas for both population dispersal as well as for commercial and industrial growth. Whether these routes become avenues for travel or corridors for development will be one of the major planning considerations of the future.

As economic linkages between the Anthracite Region and the rest of Megalopolis develop,more and more satellite industries will locate between Carbondale and Pottsville and provide incentive to the Region's young people to stay at home.

REGION 4

Region 4, which is characteristically recreational, must attempt to change its employment structure; that is, from seasonal to year round. Its most active industry is apparel (SIC23) which employs mostly women, but with better access roads to manufacturing centers in Region 5 (Wilkes-Barre-Scranton) and Region 7 , the jobs for men might improve (See Table D-3).

Sayre-Athens is already the Region's primary manufacturing employment center. With the Region's largest available industrial park, future growth may become even more concentrated with this U.S. Route 220, U.S. Route 6 corridor, with a possible second linear focus along U.S. 11 and I-81 in Susquehanna County.

Region 4's economy is becoming closely integrated with that of the New York metropolitan communities of Corning, Elmira and Binghamton. These ties take the form not only of commuting travel, but also of the establishment of branch plants in Region 4 to manufacture components used by industries along the New York Route 17 industrial complex. The further development of this potential is most likely to benefit the northern part of the Region and those areas linked to U.S. Route 17 by improved north-south highways.

Most of Region 4's recent growth in manufacturing has taken place in Bradford County, where the twin Boroughs of Sayre-Athens represent the Region's major employment center. The relocation of U.S. Route 17 south through these Boroughs will give a boost to the development of their 1,000 acre industrial park at the junction of U.S. Routes 17 and 220. The junction could become the Region's primary growth point (See Figures 2-1 and 3-5). Apparently, as in the past, the Region continues to serve as a subcontractor of goods and services to the New York Route 17 industrial area. Just as branch plants were established in the Region to feed New York State apparel and leather factories in the past, new branch plants from that State are locating in Region 4. An example of this trend is the Corning Glass plant at Wellsboro (related to the Corning, New York plant) and the Bendix plant at Montrose (related to Binghamton, New York plants).

Considering the increasing prominence of science-based growth industries in the fields of electronic data processing and glass associated with the New York Route 17 complex, further development of such inter-regional economic integration could be especially beneficial to Region 4, and should be planned for and promoted as in a region-wide program.

The Region is primarily recreational, blessed with a great recreation potential because of its forests, scenic attractiveness and unpolluted waters. The "Endless Mountains" regional-wide tourist agency is currently attempting to promote, expand and develop this potential. The community leaders of the Region are very intense about developing tourist attractions as well as "Branch Industries" on U.S. Route 6 rather than U.S. Route 17 in New York; thereby enhancing the Region's proximity to their urban markets and large labor supply (See Figure 3-5).

The unpolluted waters of Region 4 play a very important role in the dairy industry. As long as dependable water supplies can be developed and enough cattle feed can be grown locally, the close proximity of the New York and New Jersey metropolitan milk markets will continue to support the Region's dairy industry (See Figure 3-4).

The needs of Region 4 are formally concentrated around improvements to U.S. Route 15 which can provide a continuous north-south facility; Maryland to New York and to U.S. Route 220 which services South Waverly-Sayre-Athens, a significant growth center, and the largest manufacturing employment center featuring its only large development park with real potential. Improvements to U.S. Route 6 along its east-west axis, Towanda to Scranton, will help New York traffic to western New York and northern Pennsylvania (See Figure 3-3).

REGION 5

Region 5 is endowed with the fourth highest population density in the State. However, the population is decreasing. Between 1940 and 1966, 340,000 people left the Region. A "Scranton Plan" was devised in an effort to raise money to attract outside manufacturing. By 1963 Scranton and Lackawanna Counties had attracted seventy new plants and aided in the expansion of one hundred others. Their renaissance determination was further exemplified when communities throughout the Region were able to bring in 142 new factories by 1965. Financial aid for this goal was extended from (PIDA) Pennsylvania Industrial Development Authority.

Manufacturing employment has increased from 28% of regional employment in 1950 to 39% by 1960. Manufacturing has now replaced the anthracite mining of the 1950's. The largest portion of manufacturing jobs is in the apparel industry (See Table D-3). A large share of manufacturing employment in the Scranton area is in publishing, dresses and men's trousers. Employment in other industries, such as textiles, food, leather and tobacco, represents approximately one-fourth of the total for Luzerne and Lackawanna counties (Refer to Tables D-2 and D-3).

Growth in trade and services has generally lagged, due to the effects of job losses on Regional income and population during the 1950's. Future changes in mining employment are unlikely to have a significant impact on the Regional economy. Local industrial development efforts have had significant effect on the employment opportunities of Luzerne and Lackawanna. But, the most important drawback towards industrialization of the area is the difficulty of finding good industrial sites in the valleys where mine residue and culm piles exist.

With local funds available, industrial development corporations in Region 5 hope to draw upon PIDA loans to purchase and develop industrial parks. The sites for these industrial parks have been located near future interstate highway interchanges within easy commuting distance of the large urban centers. They have also been fairly well dispersed throughout the Region with one or more of these parks in each county.

Wilkes-Barre's proposed 220 acre industrial park and Carbondale's mine fire project are ways in which urban renewal is being utilized in Region 5. With State and Federal aid, Wilkes-Barre's Redevelopment Authority hopes to clear an area for future industrial use within the City limits close to existing utilities and proposed major expressways.

The area benefits from its strategic position within a network of interstate highways which criss-cross the Area. Important development can be expected near the intersection of the north-south and east-west routes which converge on Luzerne and Lackawanna Counties, giving the Area the potential for new industries and wholesale and warehousing activities (See Figure 3-2b).

Though Lackawanna County still is experiencing larger out-migration and job losses than other parts of the Region, several positive factors indicate a resurgence of the Scranton Area in the future. One of these is the new Interstate Highway system that will provide excellent access from local circulation. The large labor force concentrated in Wyoming Valley from Nanticoke to Carbondale continues to provide the Region's greatest attraction for new industries wishing to capitalize on good communications to Eastern Atlantic and Great Lakes market areas. The aggressive industrial development program will continue to attract new industries into this area and provide work at home for those now commuting to work outside the Region (See Figure 3-3).

REGION 6

Region 6 has shown significant growth in SIC34 and 35 (Refer to Table D-2). Its proximity to Baltimore and new I-83 undoubtedly has acted as a plus factor. Harrisburg's historic position as a transportation center enhances its retailing and wholesaling strength. It is also a junction for I-78, 81 and 83 and the Pennsylvania Turnpike, making Harrisburg a desirable location for distribution centers and motor freight carriers serving the eastern seaboard. Government employment in Harrisburg is extensive. The manufacturing activities at Harrisburg are chiefly in primary and fabricated metals (Refer to Tables D-2 and D-3 and Figure 3-5).

Lancaster is not a transportation center. The eastern link of the Pennsylvania Turnpike was built 17 miles north of Lancaster, and no other route of the Interstate System comes within 25 miles of it. Despite this, it enjoys a thriving economy with little unemployment. The prosperity illustrates the balance of opportunities considered ideal. Forty per cent of all employees are factory workers, approximately 6% and 20% in wholesale and retail trade. Lancaster is experiencing population growth and increasing interest in tourist attractions (Refer to Figure 3-5 and 3-6).

York is a rich farming area with diversified manufacturing industries. Forty per cent of all employees are in manufacturing. York has benefited from the current era of transportation construction. I-83 connects York with Harrisburg and Baltimore, and in other directions the city's highways and railroads radiate to Gettysburg, Hanover, and Lancaster (See Figure 1-1).

Farming is relatively more successful in this Region than any other, but it is declining slowly. Farming from this Region will be feeding Megalopolis (Refer to Figures 3-4, 3-5, 3-6 and Figure 1-2).

REGION 7

Region 7 displays as great a diversity in industry as it does in landscape and topography. This ranges from the hard coal belt found in the eastern end of Northumberland County, to the agriculturally dominated rural economies of Snyder, Union and Juniata Counties. However, both areas face the problem of decline in employment of their respective dominant industries. Poor access to Region 7 has been a factor in discouraging industrial growth. However, with the completion of the Keystone Shortway and the proposed construction of by-passes around the major urban centers in the area, the Region will become much more accessible (See Figure 3-2b).

Within Region 7 there are 19 separate industrial development organizations, incorporated under the Pennsylvania Industrial Development Authority Act. Although in conflict with present trends, future manufacturing growth may occur in the area. Manufacturing growth may be stimulated along the North Branch and West Branch of the Susquehanna River by the completion of the Interstate Highway System (See Figure 3-3).

The Western section of the Region will probably experience some stimulus to growth in manufacturing jobs as the relatively poor access characteristics of the area are improved by completion of the U.S. Route 322 improvements.

Within the manufacturing sector, proportional employment in apparel, textiles, food products, chemicals and furniture industries was approximately 36% greater than for the rest of the State (See Table D-2 and D-3). However, fabricated metal products (SIC34) is strong as well as transportation equipment (SIC37) which is located primarily in Bloomsburg on I-80.

Corporation with planning commissions is most apparent in Centre County where active county planning has been underway for the last three years. In response to the Industrial Development Corporation's request, the Centre and Inter Valley Regional Planning Commissions, with their respective planning consultants, are in the process of identifying and recommending potential industrial sites. The construction of the Keystone Shortway and upgrading of U.S. Route 220 to high-speed, limited-access standards will present new opportunities for collaboration in industrial site development planning. But, the biggest challenge in cooperation between economic and physical planning may arise within the context of the Appalachia Program in the need for local development district participation in defining regional development goals and strategies.

Centre County had a favorable industrial composition in that a large share of its total employment picture is concentrated in industries which have been experiencing rapid growth nationally. Employment in these -ndustries in Centre County, particularly in services and electronics, has been expanding faster than the national rate (Refer to Table D-2 and D-3). As this growth in electronics continues, State College is becoming less dependent upon Penn State as a single source of employment in the services field, and more likely to continue expanding economically, even if the University should stabilize at some future date. Nevertheless, State College can be quite influential in getting the roads improved in the area, thus adding to State College's desirability as a manufacturing center. The Borough already ranks as the most dynamic growth center among the four scattered along the growth corridor of U.S. Route 220 from Altoona to Williamsport (See Figure 3-5).

Industrial development committee personnel from both Williamsport and Renovo expressed pressing needs for high improvements. The Williamsport needs will be met by planned high-speed connecting routes to the Keystone Shortway and improvements to U.S. Routes 220 and 15. However, the Renovo problem is one in which the relative isolation by distance is compounded by the sharp curves and narrow right-of-way on the various bridges to Renovo. A mobile home manufacturer located in Renovo has had to increase the size and length of his product to stay competitive with the fashions of his market, but now finds the local highways and bridges too narrow to accommodate his product. The manufacturer is faced with curtailing employment until menas can be found to transport his product out of town. In the meantime, Renovo is stockpiling the growing number of new mobile homes on every available level site. The Department of Highways indicates that new bridges take approximately eighteen months to plan and complete, but there are no proposals for any at this time. The lack of advanced planning and concerted action will undoubtedly cost Renovo valuable payroll until improvements are made.

Lycoming has a favorable composition of nationally growing manufacturing industries, but its industries have, in general, not been expanding at the national rate. The county has lagged behind in trade and services, although there have been increases in employment in government administration. The diversified industrial structure of the Williamsport area has resulted in a relatively skilled labor force. The size and diversity of the available labor pool is further reinforced by the worker residing in the string of Susquehanna Valley communities between Lock Haven, Berwick, and Sunbury.

The predominant commodity industries in Lycoming are fabricated metals, apparel, and textiles, which together account for approximately 40% of all manufacturing employment. Electrical and non-electrical machinery, transportation equipment (aircraft engines) and furniture also have importance in Lycoming County's diversified economy (See Table D-2).

The designation of U.S. 220 connecting Williamsport to the Shortway and U.S. Route 15 north to New York State, as Appalachian Development Highways, hopefully had promised improved east, west, and north access. Highway access south to Harrisburg remains inadequate. Improved access to industrial sites and to the Area's recreational resources is also needed (See Figure 3-2b and 3-6).

Lycoming County has two State Parks, one within the city limits of Williamsport and the other at Pine Creek, north of Waterville. By far, the largest State Park in the Region is the Bucktail State Park, stretching almost the entire length of Clinton County and including a part of Cameron County. In addition, Clinton County has Hyner Run, Ravensburg and Kettle Creek State Parks. Black Moshannon State Park in Centre County provides the greatest variety of facilities with swimming, boating, picnicking and skiing. By the end of 1965, this park will also have a new ski lodge to augment its newly developed ski slope. Though most of the State Parks in Region 8 are well developed for recreation, access to them is often poor due to poor roads and the distance separating the parks from population centers.

REGION 9

In its effort to promote, finance, and locate industrial facilities, Region 9 is faced with several disadvantages. Perhaps the most limiting factor has been its poor access. U.S. 6 serves as the Region's only east-west artery,but this highway is primarily a tourist "shunpike". East-west industrial traffic must depend, in the future, on the Shortway and Quickway, both located outside of the Region,while north-south access between these two routes is continued to the narrow and twisting U.S. 219. The most prosperous portion of the Region is the southern section along U.S. 120, between Ridgway, St. Marys and Emporium in Elk and Cameron Counties. This more accessible area, which is already experiencing a population growth, may, because of its proximity to the Keystone Shortway and established base of skilled labor in a unique industrial complex, represent Region 9's best prospect of a growth area during the next few years (See Figure 3-5). Future prospects for the eastern portion of Region 9, however, are not as optimistic, and continued population losses are anticipated in this isolated section where fewer jobs are available and farming employment is declining.

Since 1961, St. Marys has experienced the greatest growth in industrial employment (about 700 jobs) and, together with its nearby Boroughs of Ridgway and Johnsonburg,represent an industrial complex which appears to offer the best prospects for extensive growth in Region 9. The only other part of the Region which has experienced any growth in recent years is the Kane Area in McKean County which has shown a relatively modest increase of about 180 manufacturing jobs between 1961 and 1964. These two areas should receive priority consideration for improved highway connections with the Keystone Shortway. However, the already scheduled major highway improvements linking the City of Bradford with the New York State "Quickway" (U.S. Route 17) and the Allegheny River Reservoir suggest the likelihood of a second major growth area developing around this city in the northern portion of the Region. St. Marys has benefited from the increased demand for heat-resistant, and other carbon products related to new space age industries. With consistent prosperity and ample space within the borough for industrial expansion, the community had not previously seen the need for planning. However, recently more attention has been drawn to St. Mary's dwindling ground water supply, which is also of poor quality. In addition, U.S. 120 and Pa. Route 255 intersect in the central part of the Borough, which, combined with a railroad obstruction through the central part of town, create traffic congestion. As a result, the Borough and its surrounding townships have recently embarked on a comprehensive planning program by hiring the same planning consultant who prepared plans for Ridgway and Johnsonburg, and an engineering firm to study the downtown highway system and the Ares's water resources.

In the northern portion of the Region, U.S. 6 needs improvement; but the Allegheny Regional Commission plans to improve the New York Route via Elmira and Binghamton. This improved route could be bypassed, but the Region does enjoy some sophisticated manufacturing in SIC's 35-39 as well as in primary metals SIC 32 (See Tables D-2 and D-3).

REGION 10

Expansion of the Region 10's manufacturing industries has been partially responsible for its current employment improvement, but new employment opportunities have been unable to absorb all of the displaced workers previously employed in agriculture and mining (See Table D-3). Thus population continues to decline, but at a much slower rate. The slight population gains experienced since 1960 in Clarion and Clearfield Counties are still being offset by a somewhat larger decline in Jefferson County.

In Clearfield County, manufacturing jobs in DuBois, the largest city within the Region, totaled 1,535 in 1964, about the same as in 1957. Instruments and textiles represent the city's largest manufacturing industries. The Borough of Clearfield, with 1,118 jobs in 1964, experienced a modest increase of nearly 150 jobs since 1957. The most significant industries here are stone, clay and glass products, apparel and paper products. The apparel and food products industries within Clearfield County are located in Curwensville, where 871 manufacturing jobs existed in 1964, an increase of 150 since 1961 (See Table D-2).

Both the mining and railroad industries have been highly important to Clearfield County. However, during the 1950's the railroad industry in the County declined 37% (600 jobs), while mining employment decreased 56% (3,600 jobs).

In Jefferson County, Puxsutawney had 523 manufacturing jobs in 1964, a substantial 200 increase since 1957. This gain is attributed to increases in the apparel industry, the Borough's major source of manufacturing employment. Brockway experienced more than a 1,100 decline in manufacturing jobs between 1957 (1,757 jobs) and 1964 (604 jobs) as a result of the Brockway Glass Company's establishment of a subsidiary plant in adjoining Snyder Township, and the transfer of many of its employees to that facility. A decline in the number of jobs in electrical machinery occurred in Brookville between 1961 and 1964 as the Sylvania Plant phased out its operation. In 1964, there were 418 manufacturing jobs in the Borough, a major decline of nearly 650 since 1961. Located in the southeastern corner of Jefferson County, the Borough of Big Run, with 564 manufacturing jobs in 1964, experienced an increase of about 100 jobs in three years. Nearly 90% of these jobs are in the manufacturing of leather footwear, which represents all of the County's employment in this industry.

In Clarion County, the Borough of Clarion was the only significant manufacturing center in 1964 with 1,052 jobs, an increase of almost 100 since 1961. The Borough's heavy dependence upon the Owens-Illinois Glass Plant is best illustrated by the fact that 90% of the manufacturing jobs are in stone, clay and glass products (glass containers).

Manufacturing data indicate that the stone, clay and glass industry was the largest regional employer with approximately 36% of total manufacturing employment in the Region. More than half of these workers were employed by the Brockway Glass Company in Brockway and the Owens-Illinois Glass Company in Clarion which, together, employed over 2,800 employees. Apparel factories located in Clearfield and Jefferson Counties accounted for another 11% of the regional employment. Other important manufacturing industries in the Region were food and kindred products with 941 employees, approximately 7.5% of total manufacturing employment, leather products 5.2%, and instruments 5%.

The second most important industry is service employment which accounts for approximately 17% of regional employment. This is followed by retail trade which employs 16% of the Region's labor force. A substantial amount of employment in retail trade and services is derived from tourism, with many merchants located in small towns along the highways earning a portion of their income from services provided to transients.

In recent years, commuting to jobs outside the Region has been increasing due to the loss of jobs in coal mining. In 1960, approximately 13% of total resident wages and salaries were earned outside the Region.

Historically, Region 10's manufacturing sector has been rather heavily specialized in the glass industry. Unfortunately, the Region has simultaneously lost an almost equal number of jobs in electrical machinery, which has been significant to industry growth in nearby states and gained employment in the low-wage apparel and leather products industries, which have been moving south towards the older industrial states.

In their effort to promote, finance, and locate industrial facilities, Region 10's industrial development groups have been confronted with serious handicaps. In addition to financing limitations, poor access to the Region has hitherto hindered economic development. Attempts to improve inadequate air travel facilities and highways are under way, as well as efforts to maintain the already diminished rail service (See Figure 1-1).

One of the prime factors retarding industrial growth in the Region has been its isolation from the State's major urban centers. Upon completion of I-80, the most direct route between Chicago and New York, this area will become more accessible to distant populations. A 25 mile strip of this highway is already in use between Emerickville and Corsica.

The Region's lack of major industrial centers and its isolation, due to inadequate high speed highways and hilly terrain, have impeded growth. The completion of the Keystone Shortway, about 1970, will make this Region's existing and proposed recreation facilities more readily accessible to large urban populations outside of the Region. In addition, the scheduled improvements to U.S. 322, between Philipsburg and the base of Bald Eagle Mountain in Centre County, will enable persons from Eastern Clearfield County to commute to the prosperous State College Area.

If the proposed Allegheny River Valley Expressway can be extended into Region 10 from Pittsburgh, this highway would shorten travel time to Pittsburgh and tend to expand the importance of the western portion of the Region's existing dairy products specialization.

REGION 11

Distances from markets, general inaccessibility, obsolescence of industrial plants and a host of environmental problems combine to hinder industrial development in much of Region 11. However, improvements to the major north-south highways, U.S. 219 and U.S. 220, under the Appalachian Program were to provide improved access to the Keystone Shortway and Pennsylvania Turnpike. A recreation industry, based upon proposed and existing State Parks and reservoirs, will promote an increase in vacation and weekend home building. The Laurel Highlands and Juniata Mountains Recreation Associations are already actively promoting tourism throughout the Region (Refer to Figure 3-6).

Manufacturing now exceeds transportation in terms of employment in Blair County and in 1964 the most significant manufacturing industries were textiles, food, electrical machinery and leather (Refer to Table D-2 and D-3). While employment in trade and services has not expanded at the national rate, manufacturing employment has shown increases in the proportion employed in growth industries, which is growing faster than the national rate.

While Altoona is the largest city between Harrisburg and Pittsburgh, it does not serve the economic function of a large multi-county commercial and industrial center. This can be attributed, in part, to deficiencies in access between Altoona and the surrounding region (See Figure 2-1). New roads connecting Altoona to the Pennsylvania Turnpike in the Six-Year Plan could be of great help. Within the Altoona urban area, access to the central business district is especially difficult. Altoona is within convenient driving distance of a number of State recreational facilities. Under Project 70, Altoona and its nearby communities, have begun to provide for increased local recreational needs (See Figure 3-6).

While industrial development groups provide new industry, two new power-generating plants, The Conemaugh and Homer City projects, nearby in Region 12, will each require approximately 1,200 construction workers and an additional 200 operators and 500 miners upon completion. Both of the new facilities are mine-mouth oriented and are expected to result in long-term employment for an additional 1,400 workers in a multi-county area.

The increase in low wage jobs in Region 11 is not necessarily detrimental to the regional economy. These new jobs perform the function of providing employment for persons who previously had few job opportunities, and they provide a stabilizing effect on the regional economy (See Table D-2). But, because the low wage jobs are found in the apparel industry, employing mostly women, there is a great employment need for men.

As highway improvements are made in the Region, a less centralized industrial pattern can be expected as well as a sizable increase in service industry employment. It also appears that the coal, steel and railroad industries have adjusted to new market conditions and that influx of diversified industries will reduce the Region's reliance upon the older established industries. In addition, new I-70 and the proposed improvements to three of the Region's principal highways——U.S. 22, 219 and 220——will result in improved access into this Region. This condition would allow the population of the major urban centers of Pittsburgh, Baltimore and Washington to make use of the recreation facilities within Region 11. The expanded recreation industry would further stem the out-migration from the Area and provide an additional base for population and economic growth within the Region.

REGION 12

The Region is characterized by highly developed corridors which radiate from Pittsburgh along the Ohio, Beaver, Allegheny and Monongahela Rivers, Chartiers Creek in Washington County, and the Pennsylvania Railroad in Westmoreland County. Moreover, this Region's wealth in mineral resources (coal, limestone, petroleum and gas), together with the Region's advantageous rail and water access and strategic location (with respect to national markets), all have contributed to making this Region the largest steel-making center in the nation.

Within the primary metals group, basic steel making is by far the dominant source of employment. Steel making is most important in Allegheny County in terms of absolute employment, although the industry is widely scattered throughout the six-county metropolitan Region. The largest concentrations of steel mills in Allegheny County lie along the banks of the Ohio and Monongahela Rivers. The rather limited number of sufficient sized sites along the rivers has caused several problems for industrial expansion.

There is also a heavy specialization in fabricated metal work in the Region. Ten per cent of 25,000 of the manufacturing jobs in the Region in 1964 was in fabricated metals. Also, among Pittsburgh's major manufacturing sectors was the stone, clay and glass industry which employed 21,318 workers representing 8.1% of total manufacturing (See Table D-2).

Pittsburgh's economic condition is still dependent on metal manufacturing; but, it is a slow growth industry and little expansion in employment is expected. Recent estimates suggest that employment in the glass industry, as a result of new "float process" is declining, while chemical employment shows little change. Only electrical machinery, already an employer of more than 30,000 workers in the southwest portion of the Region, is expected to grow rapidly in the coming decade. Since

1960, employment in all metal-related industries has shrunk, except for production of electrical machinery (See Tables D-2 and D-3).

Additional concentrations of intensive manufacturing are found along both sides of the upper Allegheny River. The largest cluster of employment along this corridor occurs in East Deer and Harrison Townships, on the west bank, and New Kensington across the river in Westmoreland County, which have a combined total of 10,000 jobs, an increase of nearly 1,000 since 1961.

In the outer periphery of Region 12, there are five more isolated industrial communities: Butler, Ford City, and Indiana to the north and east, Uniontown to the south, and the twin communities of Washington-Cannonsburg to the southwest. The largest of those outlying industrial concentrations is the 10,000 jobs in Cannonsburg, Washington City and their adjoining Chartiers and Center Townships, at the crossroads of I-79 and 70. There has been an increase in employment which was largely attributable to McGraw-Edison expansion in Cannonsburg and to the growth in radio and TV equipment production in Chartiers Township. Region 12 appears to be a capital intensive rather than labor-intensive area (See Figure 3-3).

Region 12 has been undergoing an economic readjustment of unprecedented severity. The displacement of traditional metallurgical skills, the out-migration of skilled labor, the relative absence of an "incubator environment" to stimulate the birth and development of small, new industries, and the outmoded industrial plants and shortage of prime industrial sites with access to modern highways have all challenged the ingenuity of local industrial development agencies. There has been a fairly well-defined geographic pattern of economic distress in Region 12. This distressed area was generally that part of the Region located beyond easy commuting range of industrial centers and suffering most severely from mining and unemployment. The combined effects of out-migration, new commuter highway construction and regional decentralization of industry is thought to have moderated these regional disparities in employment quite significantly since 1960. The violent shift in employment from mining to manufacturing may, by now, have stabilized the economy of three counties (Greene, Fayette, and Indiana) and provided a more favorable base for future economic growth. Within, and to the northwest of this arc, low unemployment rates characterized almost all of Pittsburgh's suburbs, including Beaver and Butler Counties but not Pittsburgh itself.

Approximately 195,000 persons, or about 20% of the Region's work force, are engaged in business and consumer services. Almost all (92%) of this employment is located in the six-county area of Allegheny, Armstrong, Beaver, Butler, Washington, and Westmoreland Counties. Although the proportionate share of service employment in this area, which contains Pittsburgh and its population overflow, closely parallels the State norm, it is considerabley less than in other U.S. metropolitan areas of comparable size. This is because industrial specialization within this metropolitan region has produced a labor force suited to the requirements of heavy manufacturing industries. In addition, the large national manufacturing firms have provided themselves with many of the services which are ordinarily performed by outside specialists. This pattern has caused a lag in service employment which tends to discourage the location of new manufacturing industry within the metropolitan Region.

Recent interstate highway construction offers brighter prospects for development to many areas. I-79 (The Erie-West Virginia Expressway which passes west of Pittsburgh) affords the western portion of the Region a high-speed north-south route connecting the Pennsylvania Turnpike and the Keystone Shortway. This highway will also reduce travel time between the Region and recreation areas to the north and east. I-70 from Wheeling to an intersection with the Turnpike east of Pittsburgh, provides a southern by-pass around this major city. Similarly, the Turnpike provides the same service to the north of the City. Where these two limited- access routes intersect the Region's other major highways, new industrial and residential areas will likely develop. The Borough of Washington is especially well situated in this respect, as is the area near Jeannette

(Westmoreland). The Turnpike has already brought significant industrial expansion to the area between Pittsburgh and the Turnpike, near I-76 in Monroeville Township.

REGION 13

Region 13 enjoys good east-west access along I-90, rail transport on the Penn Central Railroad to New York, as well as water transportation facilities; but, the Region does not utilize them fully (See Figure 1-1). There are very low rail rates from Region 13 to the East Coast which compete with the water transportation on the St. Lawrence Seaway. Since the area is rather accomplished in industry types 34 and 35, more effort should be made to take advantage of their strategic transportation locale.

The largest population growth has occurred in the lakeside belt of townships and boroughs extending west and east of Erie. Erie's varied manufacturing includes transportation equipment, machinery, steel, electrical equipment and paper. Primary metals, rubber products, leather products, and chemicals are important manufacturers in Crawford County (See Table D-2). Manufacturing employment has shown gains in the suburbs, Meadville and Warren areas, despite the decline in their urban centers. It can be said that these counties have a favorable industrial composition in that a large share of their total employment is concentrated in industries which have been experiencing rapid growth nationally; but, they have not been expanding at the national rate (See Table D-3). This Region has not suffered a traumatic readjustment as have the Southern Alleghenies and Shortway Plateau Regions. All the counties in Region 13 enjoy a high number of manufacturing jobs. In fact, employment in manufacturing for each county is higher than the State average (Refer to Table D-2). In Lawrence, Mercer, Counties and in the cities of New Castle, Ellwood, Sharon, and Farrell most of the manufacturing jobs are in the steel industry.

The City of Erie owns property which it is trying to promote and develop in order to stimulate its economy. One of its prospects is the development of a large ship-building facility by Litton Industries. A second is the completion of a large public stevedoring terminal at a point called East Bay. Another promising endeavor is a coal loading and unloading pier next to the Litton Industries property. Although it is rumored that Litton may pull out because a competitor announced that it will soon build ore carriers similar to the one Litton has designed, the stevedoring terminal is due for completion in the summer of 1968 and will have a large warehouse and facilities for handling containerized freight. However, Erie cannot expect any immediate substantial increase in general cargo-handling, since it appears that freight rates have been adjusted to favor Atlantic and Pacific ports for containerized cargo.

Erie is looking forward to increasing its trade with Canada. If the necessary import ticket can be obtained, large amounts of refined oil could be brought in via cheap water transportation. Presently most refined oil enters the United States at Buffalo-Niagra Falls, where it is brought in by truck.

The main products coming into the Port of Erie are oil products, paper from Scandanavia, titanium ores, salt, gravel, and steel. Very little goes out of the port now. In particular, hardly any coal or iron ore pass through Erie. In years past, ore came in, coal went out; thus, keeping rail cars and ships loaded in both directions. Now the ore and coal go through an Ohio port on the Bessemer and Erie Railroad and on the Penn Central.

PLANS AND ACTIVITIES OF THE PENN CENTRAL RAILROAD

The merger of the New York Central and the Pennsylvania Railroad on February 1, 1968, yielded the largest railroad in the world. Its rails extend from the East Coast to Canada, as far west as Chicago, and as far south as Kentucky. Actually, the influence of the Penn Central extends much further than the reach of its rails. It now owns considerable acreages of land in Florida, Texas and California which are being developed for non-industrial use.

All indications are that the Penn Central plans to emphasize land development where returns on investment are substantially higher than in transportation. One example of a Penn Central land-development project, which will have considerable influence on the development of downtown Pittsburgh, is its plan to build a new office, commercial buildings, and parking complex at Penn Central Park. The tract of land to be developed is about the size of that occupied by the Golden Triangle. The complex may eventually be served by rapid transit. The Crosstown Boulevard, now under design, will provide good roadway access.

Even though there may be some shift in direction from transportation to real estate development, the primary business of Penn Central will likely be the moving of goods and people for the foreseeable future. The Penn Central's $45 million commitment to providing improved service on the North East Corridor rails between Washington, D. C. and New York is evidence of its interest in preserving passenger transportation. Furthermore, The Penn Central is scheduled to receive and operate 80 new high-speed commuter cars, two new stations, and expanded parking facilities from the New Jersey Department of Transportation by 1970 (*A Master Plan for Transportation*, New Jersey Department of Transportation, 1968).

The plans of the Penn Central regarding its freight hauling operations include continued expansions to facilitate transfer of coal. Hauling coal is the largest single source of revenue for the Penn Central ($204 million or 16 percent of its freight revenues in 1967). The new construction tied to coal-hauling will be a 10-mile extension of the Captina branch in southeastern Ohio, a 35-mile extension of the Captina-Waynesburg Southern Railroad into southern Pennsylvania, and a $11.5 million automated coal pier at Ashtabula, Ohio. The latter project seems to be an indication that the Penn Central does not plan to return any of its coal hauling operation to Erie.

One interesting aspect of the merger is that it gave the joined railroads two east-west routes. The water level route of the former New York Central (NYC) runs across New York State through Erie to Chicago. The Pennsylvania Railroad (PRR) Main Line runs from Philadelphia through Pittsburgh and on to Chicago. A management decision to shift some of the freight traffic off the Main Line to the water level route which clearly offers operating efficiencies, *i.e.*, less power and fuel, is required to haul longer trains when the terrain is level. Estimates are that train miles on the PRR are being reduced by about a third (9.2 million miles). The NYC train miles will be increased by about 3 million miles for a net saving of more than 6 million miles. This will mean longer but fewer trains on both routes. A new $28 million electronic classification yard is being built at Selkirk, N. Y., to handle the increased volume of cars more efficiently.

Basically, all east-west traffic between points west of Columbus and Youngstown, Ohio and points north of Linden, N. J., (including points in New England, northern New Jersey, and metropolitan New York) will move over the water-level route of the former New York Central via Cleveland, Buffalo and Albany. Traffic moving east-west between western points and those south of Linden, N. J., will be routed over the former Pennsylvania route through the Alleghenies via Pittsburgh and Harrisburg.

In order to get some indication of the nature of the through traffic across the Main Line of the PRR before the merger, a special analysis (Table D-4) was made of car movements. The purpose of the analysis was to determine approximately how much high-value volume traversed the state, which might advantageously be carried on a proposed Keystone Corridor high-speed rail line across the State (See Appendix H for a description and evaluation of the Keystone Corridor concept). The thought was that only high-value freight would justify paying a premium for rush movement across the state and that high value freight would ordinarily move by TOFC/COFC (Trailer on Flat Car or Container on Flat Car), or occasionaly by conventional box car.

The analysis was made from data on rail car movements provided on magnetic tape by the Penn Central Railroad. These tapes contained data on all freight movements made by the Pennsylvania Railroad during the month of November, 1967, with some overlap from the months of October and December. In total, the tapes detailed some 525,000 commodity movements,

Table D-4. Estimated Trans-Pennsylvania Rail Car Movements For the Year 1967

Estimate is a scale-up based on ratio of U.S. rail car loadings during the year 1967 as compared with U.S. loadings during five weeks, principally in November 1967. The U.S. loading ratio of 10.159403 was applied to the Trans-Pennsylvania rail car movements which occurred principally in November 1967.

Origin	Destination	TOFC/COFC	Boxcars	All Other Cars	All Classifications of Cars
Loaded East-Bound Cars					
Pittsburgh	Philadelphia	41	20	112	173
Pittsburgh	New Jersey	589	152	30	772
Pittsburgh	Delaware	0	0	0	0
Pittsburgh	Maryland*	10	173	0	183
W. of Pittsburgh	Philadelphia	23,488	53,469	7,051	84,008
W. of Pittsburgh	New Jersey	33,191	92,613	34,390	160,193
W. of Pittsburgh	Delaware	71	30,712	8,778	39,561
W. of Pittsburgh	Maryland*	5,435	50,899	15,635	71,969
	Total	62,825	228,038	65,996	356,859
Loaded West-Bound Cars					
Philadelphia	Pittsburgh	508	295	51	853
New Jersey	Pittsburgh	772	965	305	2,042
Delaware	Pittsburgh	0	61	701	762
Maryland*	Pittsburgh	20	244	91	356
Philadelphia	W. of Pittsburgh	14,599	33,313	2,164	50,076
New Jersey	W. of Pittsburgh	18,429	33,668	9,265	61,363
Delaware	W. of Pittsburgh	20	10,302	4,429	14,751
Maryland*	W. of Pittsburgh	2,489	7,223	16,540	26,252
	Total	36,837	86,071	33,546	156,455
Loaded Cars in Both Directions		99,662	314,019	99,542	513,314

*All Maryland shipments assumed to traverse the state via Harrisburg.

SOURCE: Adapted from records of the Penn Central R.R.

which, at some point, traversed the Pennsylvania's railroad lines. Each movement recorded on the tape is described by the following information:

1. State and city in which commodity movement originated
2. State and city in which commodity movement terminated
3. Junction at which Pennsylvania Railroad picked up the commodity
4. Junction at which Pennsylvania Railroad dropped the commodity
5. Name of commodity
6. Weight of commodity
7. Date of shipment
8. Indicators for special traffic (government, export, import, etc.)

Most of the information supplied was not coded. Standard abbreviations for states were used, and all weights were recorded in pounds; but, the city names and commodity names were simply given as nine and six character abbreviations, respectively, and were not standardized. The enormous amount of data included, as well as the lack of standardized codes or abbreviations, made any detailed analysis of data unfeasible within the time frame of this study. A single analysis of east-west movements across the State of Pennsylvania was performed.

To complete this analysis, all movements were divided into three separate categories:

a. TOFC-COFC
b. Boxcar
c. Other

Since no indication was given within each record as to the means by which the commodity was carried, the separation of movements into the three categories specified above was done only on the basis of the commodity name.

TOFC-COFC were separated out by using the special indicators in some cases. Other such movements were identified by having T (Trailer) or C (Container) indicated instead of a commodity name. The separation of the remaining movements into the second two categories was done solely on the basis of the commodity name. Heavy machinery, automobiles, feed, coal, ore, and other such commodities were classified as "Other," while household items, finished products, and most food products were assumed to have traveled in box cars. Chemicals were divided between the two categories, since various forms of such commodities might require tankers or permit shipment in box cars.

Once the movements had been divided into these three categories, tallies were made of all movements within each category which traversed the state in either an east or west direction. In order to determine the trans-Pennsylvania movements, certain assumptions were necessary:

1. Maryland-Pittsburgh traffic traverses Pennsylvania
2. New Jersey-Pittsburgh traffic traverses Pennsylvania
3. Delaware-Pittsburgh traffic traverses Pennsylvania
4. Philadelphia-Pittsburgh traffic traverses Pennsylvania
5. Traffic between either Maryland, New Jersey, Delaware or Philadelphia, and any of the following places is assumed to have traversed the State:

Alaska
Arizona
Arkansas
California
Colorado
Idaho
Illinois
Indiana
Iowa
Kansas
Kentucky
Louisiana
Maine
Massachusetts
Michigan
Minesota
Mississippi
Missouri
Montana
Nebraska
Nevaka
New Mexico
North Dakota
Ohio

Oklahoma
Oregon
South Dakota
Tennessee
Texas
Utah
Washington
Wisconsin

CANADA
  Alberta
  British Columbia
  Manitoba
  Ontario
  Saskatchewan
MEXICO

Once tallies were made of all east-west movements in each of the three categories, a scale factor was applied to all figures to indicate rail movements for the entire year of 1967. This scale factor was based on the ratio of U.S. rail car loadings during the year 1967 as compared with U.S. loadings during five weeks, principally in November, 1967. This U.S. loading ratio of 10.159403 was applied to the trans-Pennsylvania rail car movements which occurred principally during the same five week period, *i.e.*, the railroad's monthly distribution of traffic was assumed proportional to the monthly distribution of rail traffic throughout the country. The results of this analysis are depicted in Table D-4. Different origin-destination pairs assumed to be part of the east-west movements in the State are separately listed to indicate the distribution of traffic among these pairs.

There are some faults with the technique. First, satellite towns around Pittsburgh and Philadelphia were not included in the analysis. This means that the number of trans-Pennsylvania rail movements is understated somewhat. However, a quick review of the computer print-outs indicated that most of the shipments to satellite towns around Pittsburgh and Philadelphia were low unit value commodities such as iron ore, sand,

and coal. While the tonnage movement of such materials is great, such materials probably would not warrant premium payments for high-speed movements on the Corridor. Pittsburgh and Philadelphia generated a much greater percentage of high-value freight than any other major cities in the State.

A second source of error was in interpretation of the commodity moved. Some abbreviations for commodities were very difficult to read because of the nature of the alphabetic coding used. But more important, assumptions had to be made as to which cars were boxcars, based on human judgement of what kind of car usually carries the commodities listed. The recognition of TOFCs and COFCs presented no problem because they were lumped together and coded as such on the print-out.

A third source of error was in drawing conclusions about annual movements of rail cars based on approximately one month's sample. An adjustment was attempted to reflect seasonality. The ratio of annual rail car loadings to November loadings was used as a factor in scaling up the trans-Pennsylvania rail movements (Carloadings, Railway Age, December 4, 1967, and January 8, 1968). However, the November sample may have been biased toward showing an inordinately high number of TOFC/COFC cars moving east. The sample contained many movements of commodities moving from the midwest to the east for resale during the Christmas season, *e.g.*, Christmas trees. Such bulk commodities as ore, coal, sand, and gravel did not appear in east-west movements because their geographic origin and their relatively short hauls excluded them under the assumption used in determining which movements truely traversed the length of the State.

The conclusion is that even when sources of error are considered, the technique still seems reasonable for the purposes in intended.

APPENDIX E

DEMOGRAPHIC TRENDS IN PENNSYLVANIA

INTRODUCTION

Now entering the last third of the 20th Century, Pennsylvania finds itself recovering from the impact of having been by-passed by many significant sociological and technological developments. The trends show that population growth has slowed down considerably and suggest that the future may involve less the growth of the State than the improvement of it.

Although Pennsylvania's 45,000 square-mile area is but 33rd in size among the fifty states, it is third in population, estimated at 11.5 million people in 1965. It has the second largest work force engaged in manufacturing, produces the most steel and pigiron, is the third largest coal producer and ranks fourth in mineral production. In any other economic indices the State ranks among the nation's leaders. The State has 436 airports which gives it fourth rank; 8,502 miles of primary highways, ranking eighth; and 8,693 miles of railroads, placing it in third place behind Texas and Illinois. Its port on the Delaware is the nation's second largest.

There are some unpleasant economic facts indicating gaps which must be filled. The State's percapita income in 1965 was 18th and the median school years completed in 1960 ranked 33rd. Necessarily, this implies that more attention to job development and educational training will be needed. Indeed, the twelve states of Appalachia and the Federal government have joined together in the Appalachian Regional Commission for just these purposes, promoting economic development by allocating funds for communities needing highways, manpower training, health facilities and other basic facilities essential to economic growth. This cooperative program augments other Commonwealth programs and is supposed to bring $200 million of increased Federal money to Appalachia Pennsylvania over the 1965-71 period. However, much of this money has failed to reach Pennsylvania due to cutback in the Appalachian programs.

Ten of Pennsylvania's thirteen regions are included in Appalachia, the mountainous sections of twelve states that have suffered long-run economic difficulty, particularly since the end of World War II. Of Pennsylvania's sixty-seven counties, fifty-two are in Appalachia where jobs disappeared faster than new ones could be developed. Economic reverses hit exactly where Pennsylvania's Appalachia had the greatest specialization; railroading, coal mining and steel making. At the same time general farming gave way to the specialized "farm factory" adding many people to the job market. As a result, this stimulated many jobless workers to migrate out of the State. Migration from Regions 12 and 5 has been particularly pronounced.

Not all of Pennsylvania has been hit as hard as Appalachia. Although Appalachia covers 80% of the land, it includes but 50% of the population. The other 50% reside southeast of the Blue Mountains in Region 2, 6, and 12. These regions enjoyed relative prosperity and have experienced relatively less unemployment than their neighbors to the west. Southeastern Pennsylvania has prospered through its participation in the flourishing Atlantic urban region of Megalopolis.

Despite the apparent division in the Commonwealth's population as well as prosperity distribution, there are unifing factors between them. All regions agree that State action and resources should help rejuvenate Appalachia. The Pennsylvania Industrial Development Act, which authorizes funds for assistance to communities suffering chronic unemployment, was to be the forerunner in Pennsylvania of programs aimed at area redevelopment. This act has helped to attract new industry, but lack of sufficient funds currently casts doubts on the future of such activities.

Rivers and landforms are another unifying element. The Delaware and Schuylkill in the East contributed substantially to the success of Philadelphia and the growth of Pennsylvania westward. The Susquehanna-Juniata River system became the course followed subsequently by railroads and highways. The Ohio River and its tributaries have directed much of the transportation development in the western side of the Commonwealth, *i.e.*, canals, railroads, and highways followed.

Three of the most significant landforms in Pennsylvania are the Older Appalachia, the Newer Appalachia, and the Allegheny Plateau. The Older Appalachia consists of the eroded limestone lowlands of Chester, Lancaster, and York counties as well as the Triassic lowland extending from Bucks to Adams County. The Newer Appalachia, often referred to as the Ridge or Valley section, is a series of parallel ridges rising sharply above adjacent valleys, cutting a fifty-mile wide arc across the middle of the State from south to east. The Allegheny Plateau covers the northwestern quarter of the State. Each of these landforms has had an influence on development. In the Older Appalachia rich soils produced the broad agricultural expanse that gives the countryside a distinctive way of life. Here transportation routes have been direct and easy to build, cities house a variety of industries, and prosperity has prevailed since 1945.

Newer Appalchia, where economic Appalachia begins does not enjoy the rich limestone soil of Older Appalachia, so farming is less widespread. The ridges,which extend for several hundred miles, have channeled settlement and communications up and down the valley floors. Where rivers cut through these thousand-foot high ridges, communities developed in response to intersecting travel routes and to the presence of iron ore, coal, clay or sand deposits which supplied the raw materials for industries. Canals, railroads, and highways were built into these manufacturing centers. But Pennsylvania had been late in developing railroads and canals westward. In fact by 1850, no substantial town had grown between Harrisburg, in the Susquehanna Valley, and Pittsburgh in the Ohio Valley. Baltimore and New York had been much more active in this type of construction. The ridges of Appalchians tended to isolate one valley from another and make road building from valley to valley expensive. Relative isolation plus only moderately fertile soil kept the population sparce except around mining and manufacturing centers. Now, perhaps scenic tourist roads can be justified on the ridge lines, where construction costs are relatively less expensive at constant elevation and where the views are outstanding.

To the west, the influence of the Allegheny Plateau as a unifying factor is due mostly to its mineral deposites. The Plateau's dissected tablelands have provided few convenient or direct transportation routes. Pittsburgh and the area's river system became the focal point for most of the Allegheny Plateau.

At Harrisburg, the common interests of Philadelphia and Pittsburgh were acknowledged by the creation of the Main Line of the State Works, *i.e.*, the State owned canal and railroad route built to keep these cities in competition with other cities vying for trade with the west. Other branches were built as well--to Erie in the northwest, to Scranton in the northeast, and to Williamsport and Lockhaven in the north central part of the State. Although, since the turn of the 19th Century, transportation has been the greatest unifying influence among different regions of the Commonwealth, it has lagged behind New York. When comparing the 1850 distribution of cities in New York State and in Pennsylvania there is a striking connection between urban growth on the one hand, and transportation networks on the other. But the growth of New York City and its metropolitan region has been much more rapid than that of Philadelphia, especially since 1890. Since 1920, Pennsylvania suffered from the decline of coal mining and from the fact that its mountainous western areas were more difficult to travel. These mountainous areas were more difficult to travel--particularly in the "automobile era"--than were the routes forming the famous "Y" in New York State.

This unity of action among the Regions has been greatest in the area of transportation. Counties with shared needs and interests have successfully promoted the Keystone Shortway (Interstate 80) since 1940. It is soon to be completed as a direct east-west highway route from Cleveland to New York giving the Region's communities better access to urban markets. Economic dislocations in mining, railroading and steel making have been unifying forces in uniting sections to seek industrial development.

To the observer, Megalopolis-the urban sprawl of the east -and

Appalachia are distinct and separate with the exception of two Appalachian Regions, 3 and 5, both having close ties to Philadelphia and New York. Population changes have followed economic fortunes: very little occurring in Appalachia and practically all of the change occurring in Regions 1, 2 and 6.

Pennsylvania's unique geographic location affords it a dynamic future. Its location between Megalopolis and the Great Lakes Industrial Belt to the west suggests that economic linkages among cities in both areas are equally complicated and appear to have their own economic regenerative force. Pittsburgh and Erie enjoy close transportation and commercial connection with this Great Lakes Industrial Belt. In Pennsylvania, it is Erie which particularly benefits from its place in the industrial belt since it has special rail, highway, and water facilities. The decision to establish a shipbuilding firm in Erie (Appendix C) emphasizes its strategic transportation position and the special advantages to Port Erie from the St. Lawrence Seaway.

As the recent history of Appalachia or Megalopolis illustrates, the Regions of Pennsylvania not only exist in their own right, but are also dependent on surrounding sections as well. There is persistent concern with economic conditions. There is a great concern for education, aid to cities, and highway investments, particularly in the Interstate Highway program creating and improving expressways through and around the Commonwealth's important urban areas. In addition, the State is concerned with farming and forestry; mining also remains a dominant influence on the Pennsylvania landscape especially in Regions 5, 10, 11 and 12. Coal reserves far outstrip demand, although the mine-mouth electrical generating stations in the middle of the coal fields are creating new demand. Lastly, of great concern, is the visual effect of "land pollution" from mining, junk yards, garbage heaps, rundown buildings, and unregulated cross traffic, all eroding the potential usefulness of expensive highways. It may not be far fetched to conceive of a future in which one works at home perhaps hundreds of miles removed from his central headquarters. Communication would be via television and tele-print machines. In effect, a worker might locate his home without considerations of commuting. Such freedom would make the Appalachian Mountains of Pennsylvania one of the most desirable areas for homes and recreation. However, such elysian settlement patterns will not occur until much beyond 1975, and not until the landscape is cleared of unaesthetic by-products of civilization.

The following regional analyses will give details on significant economic and social forces affecting each of the 13 Regions of the State.

EGION 1

Region 1 lies in the heart of Megalopolis. Characteristics of the egion include: the tides of people that sweep into office centers, the rowth of white collar work while manufacturing declines, the constant ivision of labor with increasing requirement for specialization, and he great carving up of the landscape into areas of specialization (See able E-2).

The pattern of Region 1's population growth has been greatly influenced y the location of industry in corridors extending from the central city, stride major transportation routes. These corridors lead from Philadelphia nto neighboring Pennsylvania counties, extending all the way to Wilmington long the Delaware River, west to Coatesville in Chester County, northwest long the Schuylkill River to Reading in Berks County, and north along the urnpike Extension and U.S. Route 309 to Allentown and Bethlehem. In ecent years, the areas between these corridors have also begun to experience more intensive development. In 1950, the City of Philadelphia contained 66% of the Region's population. However, the central city's population declined to 55% of the total regional population by 1960. During this time, the "urbanized area" beyond Philadelphia increased its share of the regional population total from 24% to 31% (See Table E-1).

This rapid urban growth is also affecting the New Jersey side of the Philadelphia SMSA. Agricultural lands south of the Delaware River can expect to feel the impact of urban expansion. An improved system of highways in this portion of New Jersey will result in extensive industrial development along the south bank of the Delaware. The development of a mass transit system could make extensive areas on this New Jersey side more accessible to downtown Philadelphia than many portions of Region 1. Since its origin, Philadelphia has dominated the everyday activities of

TABLE E-1

RATES OF GROWTH OF STANDARD METROPOLITAN AREAS IN MEGALOPOLIS, 1900-1966

Standard Metropolitan Area	Population in Thousands		Percentage Increase or Decrease					1900-1950	1950-1966
	1966	1950	'40-'50	'30-'40	'20-'30	'10-'20	'00-'10		
Manchester, N.H.	203.6	157.0	8.4	3.4	3.4	7.5	11.9	39.4	29.7
Boston, Mass.	3,215.5	2,875.9	8.3	1.7	12.8	14.3	20.1	70.6	11.8
Brockton, Mass.	310.3	189.5	12.2	4.0	3.4	8.8	26.6	66.2	63.7
Worcester, Mass.	622.7	546.4	8.5	2.7	7.9	13.9	15.2	57.5	14.0
Fall River, Mass.	423.7	381.6	4.6	0	1.6	12.7	26.4	51.4	11.0
Pittsfield, Mass.	147.1	133.0	8.7	1.3	6.8	7.4	10.0	39.0	10.6
Springfield, Mass.	544.7	455.6	12.6	-0.9	10.4	25.5	25.7	94.3	19.6
Hartford, Conn.	872.5	539.7	19.9	6.9	25.3	34.3	28.0	176.1	61.7
New Haven, Conn.	727.8	545.8	12.7	4.5	11.6	23.1	25.3	102.8	33.3
Bridgeport, Conn.	760.6	504.3	20.5	8.2	20.5	30.8	33.2	173.8	50.8
Providence, R.I.	831.5	681.8	7.5	2.9	14.9	12.2	28.7	81.4	22.0
Albany	710.7	514.5	10.5	1.9	11.8	6.4	15.0	54.0	38.1
New York-Northeastern N.J.	13,993.7	12,912.0	10.7	7.4	27.9	20.5	39.6	155.7	8.4
Trenton, N.J.	300.3	229.8	16.5	5.4	17.1	27.2	31.8	140.9	30.7
Atlantic City, N.J.	173.5	132.4	6.7	-0.6	48.8	16.7	54.9	185.3	31.0
Wilmington, Del.	485.3	268.4	21.0	12.1	7.1	23.1	11.1	98.5	80.8
Reading, Pa.	288.1	255.7	5.7	4.4	15.4	9.6	14.8	60.2	12.7
Scranton, Pa.	222.4	257.4	-14.6	-2.9	8.4	10.3	33.9	32.8	-13.6
Wilkes-Barre, Pa.	332.2	392.2	-11.2	-0.8	13.8	13.9	33.5	52.6	-15.3
Harrisburg, Pa.	406.6	292.2	15.9	8.0	10.3	11.0	15.7	77.3	39.2
Allentown, Pa.	523.9	437.8	10.4	1.3	12.9	19.7	25.2	89.2	19.7
Philadelphia, Pa.	4,753.9	3,671.0	14.7	2.0	15.6	19.7	19.9	94.0	29.5
Lancaster, Pa.	303.4	234.7	10.5	7.9	13.3	4.1	4.9	47.4	29.3
York, Pa.	318.0	202.7	13.9	6.5	15.6	5.9	17.2	74.2	56.9
Baltimore, Md.	1,981.6	1,337.4	23.5	10.0	15.6	18.3	14.7	109.2	48.2
Washington, D.C.	2,604.9	1,464.1	51.3	44.0	17.9	28.4	17.6	286.7	77.9
SMSA TOTAL	36,058.5	29,612.9						115.9	21.8

Source: Adapted from Donald J. Bogue, Population Growth in Standard Metropolitan Areas 1900-1950, Housing and Home Finance Agency, Washington, D.C., December 1953, pp. 61-71, and Survey of Buying Power, Sales Management Magazine, 1967.

Region	Counties	Area (sq. mi.)	1965 Estimated Population	Persons Per Square Mile	1965 Manufacturing Employment	1965 Value Added by Manufacture ($ 000's)	1965 Agricultural Receipts ($ 000's)	State Parks	Colleges and Universities	Largest Urban Places (in order of size) and County Seats (*)	Principal Highways
1 **Southeastern**	Bucks Chester Delaware Montgomery Philadelphia	2,180	3,780,000	1,733.9	467,453	5,840,499	107,723	Washington Crossing Ralph Stover Roosevelt Valley Forge Brandywine Battlefield Ft. Washington Independence Hall	Drexel Inst. Hahnemann Med. Col. Jefferson Med. Col. Moore Col. of Art Pa. State Col. of Optometry Phila. Col. of Osteopathy Phila. Col. of Textiles & Science Phila. Mus. of Art Temple U. U. of Penna. Womens Med. Col. Chestnut Hill Col. Combs Col. Curtis Col. Dropsie Col. Gratz Col. Holy Family Col. LaSalle Col. Phila. Col. of Podiatry Phila. Col. of Bible Phila. Col. of Pharmacy Phila. Musical Acad. St. Joseph's Col. Del. Valley Col. Blessed Sacrament Col. West Chester State Col. Lincoln U. Immaculata Col. Penn Military Col. Cheyney St. Col. Cabrini Col. Eastern Baptist Col. Swarthmore Col. Villanova U. Acad. of New Church Beaver Col. Bryn Mawr Col. Gwynedd Mercy Col. Haverford Col. Rosemont Col. Ursinus Col.	*Philadelphia Upper Darby Twp. Chester Lower Merion Twp. Bristol Abington Twp. Haverford *Norristown Cheltenham Two Ridley Twp. Falls Twp. Middletown Twp. Springfield Twp. Pottstown Bensalem Twp. Radnor Twp. Upper Moreland Twp. Springfield Twp. Tredyffrin *W. Chester Phoenixville Coatesville *Doylestown *Media	Pa. Tpk NE Tpk Ext. IH 76 IH 95 IH 476 IH 676 U.S. 1 U.S. 13 U.S. 30 U.S. 202 U.S. 309 U.S. 322 U.S. 422 U.S. 611 Pa. 3 Pa. 41 Pa. 100
2 **Great Valley**	Berks Lehigh Northampton	1,585	728,700	459.7	144,777	1,407,931	59,379	French Creek	Albright Col. Kutztown State Col. Alvernia Col. Cedar Crest College Eastern Pilgrim Col. Muhlenberg Col. Lafayette Col. Lehigh U. Moravian Col.	*Allentown *Reading Bethlehem *Easton Whitehall Twp. Muhlenberg Twp. S. Whitehall Twp. Emmaus	N.E. Tpk Ext. IH 78, 176 U.S. 222 U.S. 309, U.S. 422 U.S. 611 Pa. 61, Pa. 100 Pa. 115, Pa. 512
3 **Poconos**	Monroe Pike Wayne	1,900	84,500	44.4	7,360	53,378	19,376	Big Pocono Tobyhanna Gouldsboro Promised Land G. W. Childs Prompton	E. Stroudsburg State Col.	*Stroudsburg *Honesdale *Milford	IH 84 IH 81-E, IH 80 U.S. 6 U.S. 106, U.S. 209 U.S. 611 Pa. 115, Pa. 191
4 **Northern Tier**	Bradford Sullivan Susquehanna Tioga Wyoming	4,007	146,000	36.4	12,049	133,277	61,739	Worlds End Hills Creek Leonard Harrison Colton Point	Mansfield State Col.	*Wellsboro *Towanda *Montrose *Tunkhannock *Laporte	IH 81 U.S. 6 U.S. 11, 15 U.S. 106, 220, 309 Pa. 14
5 **Anthracite**	Carbon Lackawanna Luzerne Schuylkill	2,533	805,700	318.0	116,910	796,306	28,265	Hickory Run Archbold Pothole Ricketts Glen Bear Creek	Marywood Col. Scranton U. Misericordia College Kings Col. Wilkes Col.	*Scranton *Wilkes-Barre Hazleton *Pottsville Kingston Dunmore Nanticoke Carbondale Hanover Twp. Pittston Shenandoah Plains Twp. Plymouth Tamaqua *Jim Thorpe	N.E. Tpk. Ext. IH 84 IH 81E, 81 IH 80 U.S. 6, 11 U.S. 106. U.S. 209 U.S. 309 U.S. 611 Pa. 54 Pa. 61 Pa. 118 Pa. 248 Pa. 307 Pa. 443

Source: Pennsylvania State Planning Board

Table E-2 (Continued)

	Region	Counties	Area (sq mi.)	1965 Estimated Population	Persons Per Square Mile	1965 Manufacturing Employment	1965 Value Added by Manufacture ($ 000's)	1965 Agricultural Receipts ($ 000's)	State Parks	Colleges and Universities	Largest Urban Places (in order of size) and County Seats (*)	Principal Highways
6	**Piedmont**	Adams Cumberland Dauphin Franklin Lancaster Lebanon Perry York	5,123	976,600	190 6	170,163	1 891,506	225,166	Colonel Denning Pine Grove Furnace Caledonia Mt. Alto Buchannon's Birthplace Susquehannock Memorial Lake Big Spring Sam S. Lewis Pinchot	Gettysburg Col. Shippensburg State Col. Dickinson Col. Messiah Col. Wilson Col. Millersville State Col. Elizabethtown Col. Franklin & Marshall Col. Lebanon Valley Col	*Harrisburg *Lancaster *York *Lebanon *Chambersburg Lower Paxton Twp Susquehanna Twp *Carlisle Hanover Manheim Twp Swatara Twp. Springettsbury Twp. Derry Twp. Columbia Lower Allen Twp. Spring Garden Twp. Steelton Middletown Waynesboro Lancaster Twp. *Gettysburg *New Bloomfield	Pa Tpk IH 80 IH 83 E IH 81 IH 84 U.S. 6 U.S. 11 U.S 106 U.S 209 U.S 309 U.S. 611 Pa. 54 Pa 61 Pa. 118 Pa. 248 Pa. 307 Pa 443
7	**Middle Tier**	Columbia Juniata Mifflin Montour Northumberland Snyder Union	2,533	294,300	116 1	42 642	161,048	55 879	Reeds Gap Snyder Middleswarth Raymond Winter Shikellamy	Bloomsburg State Col. Susquehanna U Bucknell U.	*Sunbury Shamokin Coal Twp Berwick *Lewistown Mt Carmel *Bloomsburg *Danville *Lewisburg *Middleburg *Mifflintown	IH 80 U.S 11 U.S 15 U.S 22 U.S 322 U.S. 522 Pa 61 Pa 147 Pa 225 Pa 405 Pa 655
8	**Upper Susquehanna**	Centre Clinton Lycoming	3,232	235,500	72 8	3[illegible],294	356,248	24 093	Poe Valley Black Moshannon Kettle Creek Hyner Run Ravensburg Bucktail Little Pine Susquehanna	Lock Haven St Col Penn State University Lycoming Col.	*Williamsport State College *Lock Haven *Bellefonte	IH 80 U.S 15 U.S. 120 U.S. 220 U.S. 322 Pa 14 Pa 26 Pa 147, Pa. 414
9	**North Woods**	Cameron Elk McKean Potter	3,293	116,900	33 9	19 [illegible]82	210,364	10,557	Sinnemahoning Elk Bendigo Sizerville Ole Bull Lyman Run Denton Hill		Bradford *Ridgway *Emporium *Coudersport *Smethport	U.S 6 U.S. 120 U.S. 219 Pa 44 Pa 449
10	**Shortway Plateau**	Clarion Clearfield Jefferson	2,395	165,800	69 2	12,867	116 389	14 996	Cook Forest Curwensville S B Elliot Parker Dam Clear Creek	Clarion State Col	DuBois *Clearfield *Clarion *Brookville	IH 80 U.S. 119 U.S. 219 U.S 322 Pa 28
11	**Southern Alleghenies**	Bedford Blair Cambria Fulton Huntingdon Somerset	4,659	511,300	109 7	8 155	453,516	54,558	Prince Gallitzin Whipple Dam Greenwood Furnace Trough Creek Cowans Gap Warriors Path Shawnee Blue Knob Laurel Hill Kooser	St. Francis Col. Juniata Col	Altoona Johnstown *Huntingdon *Hollidaysburg *Somerset *Ebensburg *Bedford *McConnellsburg	Pa. Tpk IH 70 U.S 22 U.S 30 U.S 219 U.S 220 U.S 422 U.S 522 Pa 56
12	**Southwestern**	Allegheny Armstrong Butler Beaver Fayette Greene Indiana Washington Westmoreland	6,697	2,804,400	418 7	303,831	4,239,921	80,104	Point Crooked Creek Racoon Creek Ryerson Station Laurel Mountain Lynn Run Keystone	U of Pittsburgh Carnegie Inst Chatham Col. Duquesne U. LaRoche Col. Mt Mercy Col Slippery Rock State Col Geneva Col. Waynesburg Col. Indiana U of Pa	*Pittsburgh Penn Hills Twp McKeesport Mt. Lebanon Twp. Wilkinsburg Hempfield Twp W Mifflin Aliquippa Ross Twp Shaler Twp. Baldwin Twp. Bethel *Washington New Kensington Monroeville N Huntingdon Twp *Butler Monessen *Uniontown *Greensburg Beaver Falls Butler Twp North Union Twp Ambridge Hopewell Twp. *Indiana Connellsville Canonsburg Donora South Union Twp. *Kittanning *Beaver *Waynesburg	Pa. Tpk. IH 70 IH 76 IH 79 IH 279 U.S. 19 U.S. 22 U.S. 30 U.S. 40 U.S. 119 U.S 422 Pa. 8 Pa. 18 Pa. 28 Pa. 51 Pa 65
13	**Northwestern**	Crawford Erie Forest Lawrence Mercer Venango Warren	4,877	685,500	140.5	100 536	1,203,161	86 751	Pymatuning Presque Isle McConnells Mill Chapman	Allegheny Col Alliance Col. Edinboro State Col Gannon Col Mercyhurst Col. Villa Maria Col. Westminster Col Grove City Col Thiel Col	*Erie *New Castle Millcreek Twp Sharon Oil City *Meadville *Warren Farrell Hickory Twp Ellwood City Harborcreek Twp *Franklin *Mercer *Tionesta	IH 79 IH 80 IH 90 U.S. 6 U.S. 6N U.S. 19 U.S. 20 U.S 62 U.S 224 U.S 322 U.S. 422 Pa 8, 18 Pa. 58 89 Pa 98

Source: Pennsylvania State Planning Board

its neighboring counties and adjoining Regions in many ways. The Port of Philadelphia, extending from Wilmington to Trenton, ranks as the second largest port-in tonnage of cargo handled-in the United States. New York is first with the largest fresh water port in the world. Within 100 miles of downtown Philadelphia live 25 million people. This tremendous market provides the economic stimulus for continued growth of the SMSA, which includes the five counties of Region 1 and three New Jersey Counties (Burlington, Camden and Gloucester). Eighty-two percent of the SMSA's population lives in the Pennsylvania portion.

This outward expansion of the urbanized area has proceeded farthest along four growth corridors, three of which are natural and one man-made: along the Delaware from Wilmington to Trenton; along the Schuylkill River from Philadelphia to Reading; along the Chester Valley to the Lancaster County line; and northward to Allentown along the Northeast Turnpike Extension. It will still be some years before most residents of Region 1 accept the reality of the responsibility of being members of a single greater urban community stretching from Trenton to Wilmington. If, by the time that day arrives, an undifferentiated sprawl of suburban development extends in unbroken continuity all the way to New York, Allentown, Reading and Lancaster, not only may the illusive sense of "place" have been lost, but also the capacity of local communities to act in concert as an equal partner with State and Federal government in controlling the man-made forces of development. A portion of southeastern Pennsylvania lies in the midst of America's largest and wealthiest market, the urbanizing stretch of Atlantic Seaboard, extending from Boston to Washington, termed Megalopolis (See Figure 1-2). It is upon Philadelphia's capacity to meet this market's demands that future metropolitan employment may most depend. New high-speed highways linking the Philadelphia SMSA with this northeast corridor are under construction or design and these should broaden and extend the portion of this market which can be served by reasonable access to these freeways. They can also resolve the problems of industrial and commuting congestion along existing highways in the Region problems hindering industrial development programs.

REGION 2

Region 2 forms part of the eastern fringe of Megalopolis, that eastern seaboard area characterized by growing urban centers and large, sprawling urban metropolitan complexes. Within the Region, Lehigh and Northampton Counties are already so closely integrated economically that they constitute virtually a single county, closely linked with adjoining Warren County to the east in New Jersey. Berks County has at least as many social and economic ties with the Lebanon-Lancaster Region 6 to the west as with Lehigh-Northampton to the east, and even greater commuter travel with Montgomery County and the Philadelphia Region 1 to the south. All three counties form an outer belt to the Philadelphia metropolitan area whose influences within the Region is expected to continue to increase in the future. In 1960 an estimated 7,000 daily commuters travelled into the Philadelphia area while Region 2 in turn supplied work for 6,000 daily commuters traveling south from the depressed Appalachian hard coal counties of Region 5 to the north. Residential development is beginning to spill over from the Philadelphia area into Region 2 at Boyertown in Berks County, and into the southwest corner of Lehigh County, along the Northeast Turnpike Extension. Blue Mountain will undoubtedly remain a barrier to development northwards. The Great Valley with its growing economy and excellent highway system will encourage growth along the Valley in its limestone belt. Because new limited access highways are planned to connect the urban centers of the Region to Philadelphia, this City will exert a stronger influence on the Region in the future. There will also be an acceleration of the population spillover from Philadelphia suburbs into Region 2. Similarly, the New York metropolitan area suburbs are growing westward and will increasingly influence the eastern part of the Region at Easton over the next decade or so. This will place further emphasis on utilizing the Great Valley interstate system as a regional bypass around expanding Megalopolis. Without controls, development would spread out through the Valley, replacing rural settings with new subdivisions with little regard for orderly development. Reading has grown out along the major highways towards Pottstown to the southeast, Lancaster to the southeast, Lebanon to the west, and Interstate 78 to the north. As the urban growth around Reading has expanded, it has submerged nearby small urban centers. These comprise a part of the beaded chain of small urban centers along the major highways (See Figure 2-1).

Megalopolis has already exhibited its influence on the Region (See Figure 1-2). With the existing good rail facilities, Allentown has jumped ahead as the Region's largest city. The four major cities in the Region are served by a variety of rail-lines, thus bringing the Region's businessmen into contact with financiers in New York City and Philadelphia (See Figure 1-1). Allentown also is connected with Philadelphia and Scranton by the Northeast Extension of the Turnpike and a good route (I-78) to New York and Harrisburg, making it accessible radially.

With an estimated total population of 718,000 in 1963 - (6.1% of the State total), Region 2 has consistently grown faster than the rest of Pennsylvania. During the 1940's, the Region's growth rate of 9% was 50% greater than the 6% growth rate of the State. Between 1950 and 1960 the Region's and State population growth rates increased to 10% and 8% respectively. Between 1950 and 1966, Allentown's SMSA increased 19.7% and Reading's SMSA increased 12.7% (Table E-1). Population growth is also concentrated along the major highways connecting Reading with Lancaster (U.S. Route 222), Lebanon and Philadelphia (U.S. Route 422), and U.S. Route 122 north to Hamburg and I-78. The first encroachment of Philadelphia's suburban growth on Region 2 is also seen in five southeastern Berks County townships grouped around Boyertown where the population from Montogomery County has spilled over into Berks County, raising real estate prices in that area. In Lehigh and Northampton Counties, the growth of population around the Cities of Allentown, Bethlehem and Easton has created an amorphous mass of urban population that some local officials call Lehigh City. Generally, changes in market value of taxable real property between 1960 and 1963 have paralleled earlier Regional growth patterns. According to local officials, the future looks bright. The spill-over of population from Philadelphia's suburbs into the Region can be expected to increase, and the completion of Interstate highways 78 and 80 will bring Lehigh and Northampton Counties within commuting range of metropolitan New York's spreading New Jersey employment centers.

The dominant Regional trend towards decentralization is evidenced by the growth of the rural non-farm population by over four times the rate of the urban population between 1950 and 1960. The major portion of this decentralization has occurred around the urban centers and along the major highways. This local economic upsurge, together with increased commuting opportunities into Montgomery County, appears to have reversed the net out-migration pattern of the 1950's and initiated a new period of accelerated population growth for Berks County. By contrast, Lehigh and Northampton Counties, while attaining a 7% overall increase in employment between 1950 and 1960, have experienced extreme annual fluctuations in employment due to the exaggerated effect of the business cycle upon steel-making, their dominant industry.

The Department of Internal Affairs estimates that in 1960, residents of the Region received over $31 million more in wages and salaries than Regional employers paid out. This means that about 3% more daily and weekly communters are travelling to jobs outside the Region than are commuting into the Region from surrounding areas. In manufacturing alone, however, a slightly greater number of workers commute into Region 2 than commute to the surrounding regions. This is largely due to Bethlehem Steel's location in Region 2. Between 1949 and 1959, the median family income for Region 2 rose 41% from $4,143 to $5,851. Though not quite keeping pace with the State's median income growth of 45% during the same period, Region 2 is still 2% above the State's level.

REGION 3

Region 3 has often been referred to as the Playground for Megalopolis. A part of Megalopolis as well as Appalachia, Region 3 is an economically depressed area where industrial development programs have had moderate success.

Geographical location has tended to isolate the Region from the mainstream of economic activity. The coal mining and industrial areas of the Lackawanna and Lehigh Valleys are in sharp contrast to the forested areas of Region 3 to the east and north.

Increasing competition for land and the trend toward larger and more economically efficient farm operations will probably result in further consolidations accompanied by decreases in the many marginal farms of this Region. The proposed Tocks Island recreation area will wipe out the few good dairy farms in Pike County located on the rich bottomland of the Delaware River. Highways and land subdividers will use up others. The flurry of subdivision activity, land speculation, highway proposals and the Tocks Island recreation area could easily justify an upgrading of future projections.

It was established during Tocks Island field interviews that many seasonal home buyers plan on year-round occupancy when they retire, while others would do so if employment were available in the Region. Improved accessibility and the expanding metropolitan areas to the south make this latter course a definite possibility. It has been established that there is already considerable commuting from Monroe and Pike Counties to outside sources of employment. The recreational aspect of this project will prove to be the most important to the economy of this area. The proposed National Recreation Area will occupy 60,000 acres surrounding the reservoir and is expected to attract up to 10,000,000 visitors yearly. Over 50,000,000 people live within a 100-mile radius and about one-third of the nation's population live within a day's drive.

Recent trends toward year-round operations have fostered several ski slopes and some of the larger resorts have added night club entertainment for year-round "weekend vacations". Improved access should encourage this type of operation as well as the trend toward conventions (See Figure 3-6).

Among the principal factors which will have to be considered in future planning are topographic and physical characteristics which have resulted in a sparsity of population; the highly speculative nature of population growth resulting from the impact of Tocks Island and new highways and the trend toward year-round occupancy of houses.

Monroe County, in the Poconoes resort area, has had an increasing population since 1950. The population is scattered throughout the many small towns and villages, except for the Stroudsburgs, which is the County's principal trade and service area. In contrast to most of Appalachian Pennsylvania, the problem in this area is not one of overcoming poor access as an inducement to development, but rather one of providing access to meet the probable demand. There remains a deficiency in secondary highways (See Figures 3-2a and 3-2b).

Monroe County faces the unique problem of preparing for the massive influx of new residents or visitors. It is difficult to anticipate the needs of a population when one cannot anticipate what proportion will be permanent residents, vacationers, or day visitors; or whether the permanent population will be largely retirees or commuters. I-80, 81E, and 84, to be completed in the early 1970's, will substantially improve highway access to the major urban areas to the north, east, and west.

REGION 4

The prospects for future growth in Region 4 depend to a very considerable degree upon the economic future of the exterior urban areas of Elmira-Binghamton and Scranton-Wilkes-Barre, and Region 4's ability to provide better highway access to these larger employment centers. The Bureau of Employment and Security's data indicate that employment in the New York areas may have remained relatively static since 1960, and this alone could account for the apparent reversal of Region 4's growth since that date.

However, both nearby New York and Pennsylvania metropolitan areas will benefit from major highway improvements: several Interstate Routes converging upon the Scranton-Wilkes-Barre area; and an upgrading of New York Route 17 to almost equally high speed, limited access standards. It is noteworthy that the new right-of-way for this New York east-west Route 17 will dip down into Pennsylvania at the Sayre-Athens growth point previously mentioned. The Pennsylvania Department of Highways plans to rebuild U.S. Route 220 from this point south to Towanda at a similar standard and link this travel corridor with a new bridge crossing to U.S. Route 6 at this latter borough.

The seeming stability of Region 4's total population masks two conflicting trends within the Region. While the isolated upland townships have been losing population or remaining static, considerable growth has occurred all along the Region's northern boundary wherever townships are within commuting range of the New York, Elmira and Binghamton metropolitan areas. At those points where important north-south highways such as U.S. Routes 15, 11, and 220 cross the Region, this borderline growth extends southward into the heart of the Region (See Figure 2-1). Perhaps the most impressive of these "growth corridors" is to be found in Bradford

County along U.S. Route 220 south from the New York borderline communities of Sayre-Athens to Towanda. From Towanda, this linear growth extends southeastward along U.S. 6 towards the Scranton area whose influence is fairly extensive in eastern Wyoming County (See Figure 3-5).

Changes in the market value of taxable real property indicate that these same locational trends in regional growth have continued between 1960 and 1964, with some gains occurring among isolated boroughs and among townships along the Route 220 and Route 6 axis. So far, the new I-81, between Scranton and Binghamton, appears to have had relatively limited influence upon Susquehanna County, though it is perhaps still too early to judge its long-term effects.

The Elmira and Binghamton areas, in New York State, have a major economic influence on the northern tier counties of Region 4. There is significant commutation into these New York urban centers for both employment and shopping.

To the south, Wilkes-Barre and Scranton already serve the southeastern section of the Region as shopping and employment centers. The success of the hard coal counties' industrial development program in attracting new employment will undoubtedly provide an increasing number of jobs to commuters living in Susquehanna and Wyoming Counties.

Because of the sparse population found in Region 4,none of the individual boroughs contain over 8,000 people, and the Region is characterized by many small isolated villages and towns which have developed at the intersections of major highways passing through this area.

Perhaps the closest approach to a central city is to be found in the continguous boroughs of South Waverly, Sayre and Athens and the surrounding Athens Townships which comprised a total urban population of nearly 17,000 in 1960. This urban growth area is really an appendage of the Binghamton-Elmira metropolitan area (along New York Route 17), extending south at this point into Pennsylvania along the Susquehanna River Valley. When Route 17 is improved to a limited-access highway, it will swing south of its present location in New York to pass through South Waverly in

Pennsylvania. This change and the planned improvement of U.S. 220 between New York 17 and Towanda, will encourage more industrial plants to locate here, thus creating more jobs and enhancing the role these communities already fulfill as a regional growth center. The three boroughs and one township are, therefore, at the threshold of becoming fused into a single medium-sized central city, but much remains to be done in planning this contiguous urban area as an organic whole (See Figure 3-5).

As the Susquehanna River Valley remains the natural corridor through the Region, development can be expected along its valley, particularly near Sayre-Athens and Towanda. Increased residential development will also occur in the southeastern portion of the Region near the Wyoming Valley, but its future is dependent upon the growth in the Scranton-Wilkes-Barre area. The remainder of the Region is physically isolated--with the exception of areas served by U.S. Highway 6 which is the only east-west route across the Region, and U.S. Highways 15 and 220 which run from north to south across the Region.

The improvement of these latter two routes would provide better access into the high plateau areas of the Region from the new Pennsylvania I-80 to the south and the improved New York State Route 17 to the north, thus helping develop the latent recreational potential (See Figure 3-6).

However, the major determinants of future growth will continue to lie beyond the Region's borders with the prospects for metropolitan growth in the Binghamton-Elmira and Scranton-Wilkes-Barre areas. Much of Region 4's development planning will concern efforts to extend the influences and commuter opportunities of these adjoining cities over a wider share of this largely rural region.

REGION 5

A location on the edge of Megalopolis has been a factor promoting migration and commutation from Region 5 into the prosperous regions (Regions 2 and 6) to the south for employment. There are many ties between the anthracite counties and the Poconos vacationland to the east, including both recreation and summer resort employment.

The area is already benefiting from its strategic position within the network of the Interstate Highway System. Important interchange development can be expected near the intersection of the north-south and east-west routes which converge on Region 5,giving this area the potential for the location of important new industries and wholesale and warehousing activities. Its position on the fringe of Megalopolis is already resulting in new growth in the southern section, along the first valley north of the Blue Mountains in Schuylkill and Carbon Counties where commuters to jobs in Megalopolis have settled in picturesque rural settings (See Table E-2).

The constantly growing Megalopolis to the east and south is certain to provide greater markets for farm output. As mentioned previously, dairy and poultry products increase; expansion of these farm enterprises into efficient management units would, perhaps, result in a more prosperous agriculture for the Region. However, increased emphasis on dairying would require diverting larger acreages into pastureland; but, in the long run, this may prove to be the best alternative use for farmland that is basically unsuitable for crop production (See Figure 3-4).

Where highways are concerned, the State Highway Department has solicited county planning commission views on locations for future highways in the Region. This has been done due to their realization that only county planners can identify the county's long-term development objectives and how specific highway proposals would affect such plans. From these county planning commissions have come recommendations for better access to the central cities in the Region as well as recommendations for regional connectors to make more effective local use of the Interstate freeways.

Though on a much smaller scale, Lackawanna's County Planning Commission is proposing that a scenic parkway be built between Dunmore (east of Scranton) to Carbondale in the north. This facility would be designed to handle pedestrian and bicycle traffic as well as auto traffic.

Most of the residents of Lackawanna and Luzerne Counties are concentrated in the Wyoming-Lackawanna Valley which cuts diagonally across Luzerne and Lackawanna Counties. The largest cities: Scranton, Wilkes-Barre, Nanticoke, Carbondale and Pittston will all be within the urbanized areas of either Scranton or Wilkes-Barre (See Figure 2-1). Hazelton is the only large city whose population is not declining.

REGION 6

The western half of Region 6 has long enjoyed greater prosperity and economic growth than its adjoining Appalachian counties. Much of the western half of Region 6's past population growth has been based upon immigration from these areas and as highways have improved, an increasing number of Counties such as Snyder, Northumberland, Schuylkill, Juniata and Fulton have found themselves within commuting range of Region 6.

The external influence of three nearby metropolitan areas: Philadelphia, Baltimore and Washington, D. C. have just recently begun to affect the Region by way of commuting and, in the case of York and Adams Counties, weekend and vacation cottage developments.

Region 6's fortuitous position in the most rapidly growing southern segment of Megalopolis, within the expanding metropolitan influences of Philadelphia, Baltimore and Washington, guarantees the Region all those geographic advantages prerequisite to extended future economic growth (See Figure 1-2). The prospect of better highways, lack of physical barriers and presence of many existing urban centers should ensure that the location of this future growth is widespread, benefiting all parts of the Region.

Due to proximity with the expanding Harrisburg metropolitan area, the southern slopes of Blue Mountain and the areas along the river at Dauphin Narrows are beginning to feel the effects of suburbanization. Most of the mountains of Perry County have not been intensively used for recreation, although much of the forested areas are State owned. Poor access has precluded use on a large scale.

Several factors hinder or preclude development and access for recreational purposes:

Steep bluffs, rising from the water's edge, limit points of accessibility. Where terrain has permitted routes of transportation to cross the river, towns, cities and industry have sprung up. After a hundred years of this type development, few areas are left for intensive development of any kind.

The only stretch of the Susquehanna River not yet restricted for development is the western bank, south of the Codorus Creek confluence in York County. Although restricted by steep bluffs, access is not hampered by a railroad paralleling the river, as happens on the full length of the eastern bank (See Figure 1-1).

The land extending back from the river is scenic and suitable for a variety of recreational uses. Even in this area, wherever roads penetrate to within sight of the river, cottages and summer houses are springing up. The large "Susquehanna Trails" development in Peach Bottom Township, although not located near the river, could be the forerunner of future developments in this area. Improved highways would make this area accessible to millions of people in the large urban centers of the Middle Atlantic States (See Figures 3-5 and 3-6).

In Dauphin County, the concentration of rental rooms in the Hershey and Harrisburg urban areas grew from 84% of all County rental rooms in 1961 to 88% in 1965. Within the urban areas, motels and similar facilities are found increasingly along the major highways, the urban fringes, and the central business districts of the larger urban centers of the Region.

Within the Region, the rates of population growth for the Harrisburg and York SMSA's have been accompanied by parallel economic trends, and in Lancaster, employment increases are in direct conflict with intercensal indications of slower rates of population growth which should be treated with considerable reserve (See Table E-1). Lebanon's growth appears based upon increased commuting to Dauphin, Lancaster and Berks Counties, while Adam's and Franklin's growth may be derived from both economic expansion and the influence of U.S. Route 15 improvements and new I-81.

Ribbons of growth describe the spreading cities of Harrisburg, Lancaster, York and Lebanon where the highways are lined with new homes and businesses. Industrial growth has slowly expanded in most areas of Region 6 between 1951 and 1966, although Dauphin and York have lagged behind (See Figure 3-3).

Region 6 offers good transportation connections to Megalopolis. These connections act as spokes on a hub radiating out of Harrisburg to Baltimore, Philadelphia and New York. Assets like these allow manufacturing to service many markets. To residents this access to Megalopolis means easy use of shopping and cultural advantages without big city inconveniences. The Susquehanna and Juniata Valleys have long been routes of transportation and sites for settlement. Both railroads and highways line much of their length on both sides (See Figure 1-1).

This Region enjoys a good distribution of population; a confederation of urban centers which are not water oriented. The medium size cities are prosperous agricultural centers with a good site around Harrisburg, an area with extensive freight classification yards which are fed by lines from various directions.

In Region 6, a high percentage of Perry's work force commutes to work in Dauphin and Cumberland Counties. In view of the relationship, the growth potential for Perry, including employment opportunities, depends largely on the future of the Harrisburg area and access to Harrisburg. For the workers who remain in the County, apparel is the leading manufacturing employer.

The first ridges of the Appalachian Mountains are a significant barrier between Perry and the Harrisburg area and emphasize the importance of the connecting Susquehanna and Juniata Valleys. Improved access between the eastern portion of Perry County and Harrisburg area would enchance the employment opportunities of Perry's residents (See Figure 3-2a and 3-2b).

REGION 7

The primary external ties of Region 7 are with the Harrisburg area to the south, to which a large number of daily commuters travel from the southern portion of the Region and especially from the hard coal fields in the southeastern part of the Region. To the north, Williamsport acts as a somewhat similar attraction to those communities lying along the West Branch of the Susquehanna, and a lesser flow of trade and people extends up the North Branch as far as Wilkes-Barre. Though none of the urban centers of Region 7 are over 14,000 in population, they share with the larger central cities of other areas of Pennsylvania the same problems of declining population, loss of jobs and municipal tax base, and deteriorating housing without enjoying the larger cities fiscal capacity to support their own permanent professional planning and redevelopment staff. It is anticipated that Region 7 will experience a substantial population "boom" during the next few decades because of its proximity to Megalopolis, its strategic position near the center of the State, and continuously improving highway communications. Currently, growth is occurring and will continue to occur in a linear pattern along both banks of the Susquehanna River and its two branch tributaries (See Figure 3-5).

The valley growth will be further enhanced by the completion of the Keystone Shortway which will intersect two significant highways of Region 7, U.S. 11 and U.S. 15. However, the growth will conflict with the best agricultural lands found in the Region and the rural nature of this section may undergo significant changes with continued ribbon-like developments coalescing along the major waterway corridors. Not the least of dangers involved in this form of development would be the loss of the Region's undeveloped river recreational potential.

The western part of the Region is connected with the Harrisburg area by U.S. Route 322 along the Juniata River. However, due to the rugged terrain found here, urban growth has occured mainly in the agricultural valleys near Lewistown. Outside of the Juniata River Valley it appears that the rural nature of Mifflin and Juniata Counties will remain unchanged. To the southeast, employment in the coal industry will continue to decline but the exodus from the coal towns may already have been checked by longer distance commuting and promotion of local industry.

The strip growth between Bloomsburg and Berwick is a result of decentralized linear development along both sides of U.S. 11. Southwest of Bloomsburg, suburban development is also occurring, but in a less strung-out fashion. The Borough of Danville is also experiencing suburban growth while the Borough's population declines. Generally, this trend has occurred in a majority of the boroughs in Region 7. However, Bloomsburg has shown slight increases in population though this may be due to the increase in enrollment in its State College.

Along the West Branch of the Susquehanna River, population growth has occurred in the industrializing area around the Borough of Milton, while on the west shore of the West Branch, a population spillover from the Borough of Lewisburg reflects the growth of Bucknell University as one of the sources of growth in Union County.

Along the lower Susquehanna, population growth has occurred between Selingsgrove Borough and Shamokin Dam Borough in Snyder County. Because of increased enrollment at Susquehanna University and the increase in industrial jobs in the area, Selinsgrove has shown appreciable growth while residences have spread out along U.S. Routes 11 and 15 between Selingsgrove and Shamokin Dam Borough, immediately across the Susquehanna River from Sunbury, reflecting the growing trend of commercial establishments towards the "Sunbury West Shore" (See Table E-2).

Even though the Region is sparsely inhabited, the threat of competition between rural and urban sectors for land use is present. Such a conflict is already occurring in the rich Buffalo Valley west of Lewisburg and along many other stretches of the Susquehanna River banks where urban spillover from small boroughs and ribbon-like development along the highways is encroaching on the Region's most fertile farmlands.

With the completion of I-80, 81 and 70, Region 7 will be within three and one-half hours driving time from the major eastern urban centers of New York, Baltimore, Philadelphia, and Washington. As a result, additional demand will be stimulated for the development of commercial tourist facilities.

In order to take advantage of this potential economic asset, additional recreation water impoundments must be created in this area where few presently exist. The second major improvement needed is better highways within the Region to distribute interstate highway traffic to the various recreation sites throughout the Region (See Figures 3-2b, 3-5 and 3-6). Finally, additional capital must be invested in new tourist facilities. At present there is no indication that the Region's apparent deficiency in State Park acreage will be overcome by 1980. The best potential for further development may lie along the Susquehanna River and the Sunbury rubber dam project may be viewed as an experiment which, if successful, might be repeated at several other locations within the Region. There is every likelihood that such water-oriented recreation could attract millions of visitors from the more urbanized areas to the south.

What is badly needed is a region-wide recreation plan with regional cooperation to preserve the river access now endangered by urban expansion.

REGION 8

Topography has, in the past, greatly influenced development in Region 8. The linear settlement pattern along U.S 220 and along the West Branch of the Susquehanna River will continue to prevail because expansion to the northwest and southeast will be hindered by the topography. Minor growth can be expected in some of the southern valleys and in the Susquehanna lowlands in the eastern portion of the Region, while out-migration will continue in the northern plateau area (See Figure 3-5).

Geography will continue to shape the form of future urban growth in a linear pattern, but the quality of this environment will depend upon the effectiveness of local and regional planning. With a new high speed, limited-access route, U.S. 220, linking all communities along this corridor, each municipality will gain the potential diversity of employment, shopping, recreation and educational facilities normally available only in larger centralized metropolitan areas, while retaining ready access to the nearby Appalachian Plateau at their back door and Susquehanna River at their front for outdoor recreation. This could approximate an almost perfect geographic setting for contemporary life.

Ninety percent of the labor force is employed within the Region because few jobs are available outside Region 8 within reasonable commuting time. Those that do commute from the Region to jobs outside, probably work in Northumberland and Union Counties. While a significant amount of above average limestone soils are located in the valleys of the southern portion of the Region, agriculture has been handicapped by the relative inaccessibility of markets. The agricultural lands along the Susquehanna, below Williamsport, and along the Nittany Valley of southeast Centre County, appear to have the best prospects of future growth in production, as new highways link this Region more closely with the large urban population of southeast Pennsylvania.

Two Williamsport redevelopment projects are in the planning stage. One will use spot clearance in a ten-acre downtown blighted commercial area for municipal improvements and a parking garage. A second project, covering thirty-seven acres, will acquire sufficient land for an improved riverfront highway over which U.S. Routes 15 and 220 will be channeled with controlled access just skirting the city's central business district. Several large stores wish to expand into this area and sufficient parking must also be provided. Eventually, the beltway north of the city will be built to carry regional traffic around the city.

Generally, the areas of economic growth in Region 8 are confined to the same transportation corridor along the West Branch of the Susquehanna in Lycoming and Clinton Counties and U.S. Routes 220 and 64 in Centre County. In 1960, there were 13 townships within the Region with rates of male unemployment exceeding 13%. All of those were located outside this growth corridor, most of them in The Appalachian Plateau areas such as the coal mining districts of Centre County around Philipsburg or the northwestern area of Clinton County around Renovo or the hill country of the southern and eastern extremities of Lycoming County (Refer to Figure 3-5).

Between 1949 and 1959, Region 8's median family income increased 54% (to $5,184) compared to 45% for the State (to $5,719), thus narrowing the gap between the Region and State from a former handicap of 15% to a more moderate 9%. Within the Region, all three counties have had median family incomes below the State average. Lycoming led the Region in both 1949 and 1959, but experienced the smallest percentage increase over the ten-year period. Centre County experienced the highest rate of increase in this measure of "standard of living".

Centre County has experienced uninterrupted population growth since 1940, in contrast with surrounding counties. This growth has been influenced primarily by the growth of Pennsylvania State University at State College, in the southern portion of the County. The economy of the area is now strongly oriented to the University and to commercial and industrial activity which owes its existence to the University.

The long-run rate of growth in the State College area and, to a large measure, the entire County, will be significantly influenced by actions of both the State and the University in determining the future of Pennsylvania State University.

The distance from major urban centers and the relative lack of accessibility have been factors impeding growth in Centre County. The northeast-southwest orientation of the terrain had made east-west and north-south access especially difficult (See Figure 3-4). Improvement of highway access to Harrisburg and southeastern Megalopolis area is needed. While the construction of the Shortway will provide good access to the East Coast and the Midwest, access to major transportation centers in Pennsylvania will remain a problem. Commercial air transportation service for the State College area is provided by Midstate Airport near Philipsburg, 20 miles from State College. Highway access between the airport and either State College or U.S. 220 is inadequate. Air access may be as important as highway access for many types of new industries now locating in the State College area (See Tables B-2 and B-3).

Lycoming County includes a series of small communities between Milton and Lock Haven along the Susquehanna River. Williamsport, which is responsible for most of the population growth in the County, is its major urban center. The Appalachian Development Highways are planning to form a loop, U.S. 220, linking Williamsport and Lock Haven to the Shortway. Williamsport is centrally located in relation to an extensive supply of public recreation lands, including two State parks within the County. Extensive use of Project 70 by the County and several municipalities has further expanded the available recreational resources. Although the Susquehanna River could provide a major recreational resource for several miles through the County, the recreational potential of the river remains to be established. One should remember flooding, for the Susquehanna remains a problem for many of the valley communities (See Figure 3-6).

REGION 9

Recently, with more emphasis upon the recreation industry, Region 9 has entered a new phase of economic growth. This vacationland, part of a larger Appalachian Mountain recreation complex, is advantageously located within relatively short distances of large urban populations stretching in a semi-circle from Pittsburgh to the lower Great Lakes centers of Cleveland and Buffalo (See Figure 3-6 and Table E-1).

A major handicap to tourist development is the lack of an adequate regional highway network. Two-lane U.S. 6 is the only east-west highway across the Region. However, just outside the Region and parallel to U.S. 6 are the much higher capacity, limited-access facilities of N.Y. 17 (The Quickway) and I-80 (The Shortway). The only highway, within Region 9, connecting these three east-west transportation arteries is U.S. 219 (See Figure 1-1). As a result, the entire eastern two-thirds of the Region is lacking a major north-south highway. Physically, the mountainous terrain in this eastern portion severely hinders both highway construction and economic development.

With the completion of the Kinzua Dam, the upper Alleghenies Tourist Council and Seneca Highlands Association in McKean County can expect greater tourist traffic and a heavier demand for their services. The National Forest and Park Services estimated that two million persons visited the Allegheny Forest and the Kinzua Dam in 1966. This figure is expected to increase to four million by 1974 and may ultimately approach 10 million annual visitors when these facilities have been fully developed. The reservoir impounded by the dam will cover 21,175 acres, thus creating a tremendous potential for tourist development along its extensive shoreline which lies along the McKean and Warren County boundary. The U.S. Department of Agriculture is preparing a comprehensive plan for additional public/and acquisitions and facilities and until such long-range plans are complete it is impossible to anticipate which areas of Elk and McKean Counties will be most affected. However, scheduled improvements to U.S. 219 from Bradford to the "Quickway" and the inevitable extension of this highway northward to the Buffalo metropolitan area guarantee that the Region will fully realize its share of the vast tourist potential of the Allegheny River Recreation Area (See Figure 3-6).

Because of the continued high rate of out-migration and relatively static level of Regional employment since 1958, the total 1970 population of Region 9 appears unlikely to vary much from 1960. The growing southern portion of the Region is that area closest to the Keystone Shortway. Any major improvements to north-south U.S. 219 might well stimulate additional growth in the St. Mary's area to a level which would decisively exceed losses elsewhere in the Region.

The scheduled improvements to U.S. 219 between Bradford and N.Y. 17 (The Quickway) will assure the reversal of past population declines in the Bradford area. However, this turnabout in trend is most likely to occur after 1970 when these improvements are completed.

The City of Bradford is the only urban center in Region 9 with an urban renewal program. Though comprehensive planning studies were completed for Johnsonburg and Ridgway in 1964, little has been done to effectuate the plans. While planning studies were underway, frequent contacts were made with the State Highways Department to agree upon the relocation of U.S. 219 in order to provide safer and easier access to these two boroughs. The latest proposals of the Highways Department now indicate a different right-of-way for relocating U.S. 219 than is shown in the two borough plans.

REGION 10

As previously mentioned, the Keystone Shortway, due to be completed about 1970, will have a major influence upon Region 10. This highway will help to offset the Region's disadvantage of great distances from large urban centers by providing easier access to urban markets in the expanding Lower Great Lakes Area and Megalopolis to the east. The urban centers near the Shortway interchanges will receive additional impetus for growth as they begin to provide services for the traffic along this important expressway (See Figure 1-1 and 3-2b).

1963 estimates indicate that the Region's population is already stabilizing. Current over-all regional losses result solely from continuous declines in Jefferson County. However, it is anticipated that the Region will begin to experience over-all growth within the next year or two and that the 1970 census will record a modest population gain over 1960. It is still too early to assess the extent of growth which can be expected during the 1970's since this will depend to no small degree upon the effectiveness of regional development leaders' efforts to capitalize on the industrial and recreational potential of the Shortway (See Figure 3-6).

Generally, tourist development groups are striving to awaken the Region to the potential value of tourism, particularly in respect to the Keystone Shortway which will provide a dynamic impetus to growth of tourist facilities and vacation home-building activity as residents of the urban areas to the west and south gain access to this area. The Keystone Shortway will stimulate tourism and recreation within the plateau and mountain portion of Pennsylvania. This entire expanse, encompassing an area much greater than Region 10, could develop into a major vacationland serving the urban communities of Western Pennsylvania and tourists traveling between the Midwest and Megalopolis to the east. However, Region 10 must compete with Regions to the north and south for this tourist dollar. If the Region is to realize this recreation potential, it will be necessary to develop a long-range regional tourist plan and initiate both urban and rural environmental rehabilitation.

The Bureau of Outdoor Recreation Survey of 1964 reported no county parks within Region 10. While the survey did not examine all of the Region's small communities, there are some small municipal parks in existence. These parks fail to meet the minimum standard of 15 acres of local parkland per 1,000 population; however, a number of communities in the Region have responded to the opportunities offered by PROJECT 70 by requesting matching State funds to acquire more than 500 acres of recreation land. Although this proposed addition of three and one-half acres of local parks per 1,000 persons still fails to meet the recommended local parkland standard, this is not considered to be as serious in this rural Region as it will be in more urban areas because of the large acreage of State forest and parkland available to residents of these smaller communities.

The best prospects for economic growth in Region 10 appear to exist in three clusters of communities along the Keystone Shortway - Clarion, DuBois (including Brockway and Reynoldsville) and Clearfield (including Curwensville) (See Figure 2-1). Of these, the DuBois area appears to offer the best opportunity for growth because of the existing concentration of industry in the area, its dominance as a retail trading center for many of the surrounding townships and smaller boroughs and its location near the Region's two major north-south highways - U.S. 119 and 219. Long-range improvements to these highways will supplement the City's central function and tend to stimulate growth in the southern portion of the Region, particularly in the somewhat isolated Punxsutawney area.

There is some current evidence of modest growth among these clusters. However, many of the communities within the Region are still heavily specialized in single manufacturing industries. The completion of the Shortway will transform this liability into a regional asset of diversified employment as commuting time is shortened between widely separated centers (See Tables C-2 and E-1).

REGION 11

Region 11 is situated between the urban concentrations of southeastern Pennsylvania, a portion of Megalopolis and the western Pennsylvania urban centers which represent the eastern extension of the lower Great Lakes urban complex (See Figure 1-2). As a result of this strategic location, the Region has, since its early history provided both human and natural resources to both of these urban concentrations. Historically, most communication and transportation lines connecting the State's two large urban centers have passed through this Region. The early turnpikes, canals, and railroads successively crossed the mountain barriers found in the Region.

The Region is drained by tributaries of three major river systems -- the Ohio, Potomac and Susquehanna. This large catchment area possesses excellent reservoir sites for flood control, water supply and recreation for communities outside of the Region (See Figure 1-1 and Figure 3-6).

The general scenic quality of this area together with the potential of these reservoirs represent one of the Region's most important resources. A proposed 32-mile lake on the Raystown Branch will create new development problems in this area but will enhance the recreational potential of this relatively undeveloped eastern portion of Region 11.

The Region is beginning to serve much of Pennsylvania's urban population to the east and west as well as the Baltimore and Washington metropolitan areas to the south. Bounded by the Maryland State line on the south, the Region encompasses high and rugged mountains from Laurel Hill on the west to the escarpment of the Allegheny Front. East of this line low parallel ridges and valleys dominate the landscape. The southeastern border of the Region is located along the edge of the superior agricultural lands of Region 6 and near the urban centers of Megalopolis.

Other areas of modest growth are located within the Region's southern tier counties. Both Somerset and Bedford Boroughs can attribute much of their growth to the proximity of the Pennsylvania Turnpike and accessibility to the Region's two major north-south highways - U.S. 219 and U.S. 220. In addition, growth is occurring in a linear belt along these two arteries. Since 1960, there have been significant increases in market values of taxable realty property along these north-south highways, but particularly where they intersect the major east-west routes such as the Turnpike and U.S. 22 (Refer to Figure 3-2b).

Johnstown's population has been decreasing because there were no improvements to downtown property and because of decreasing manufacturing establishments. More exciting, perhaps, is the proposal to redevelop 20 acres of downtown Johnstown into a modern shopping, medical and residential area. Abutting Roosevelt Boulevard, the project area will be easily accessible to regional traffic from improved Route U.S. 219.

Fulton County has shown substantial population increases since 1960. This growth may be attributed to the proximity and the ease of commuting to the increasing job opportunities in Franklin County and Hagerstown, Maryland. Commuting from the Region is most significant in the eastern and southern portions as a result of job opportunities in Mifflin and Franklin Counties and the State of Maryland. Recent declines of jobs in the Pittsburgh area have severly limited opportunities in that direction. Cambria and Somerset are in the semi-mountainous Allegheny Plateau section to the east of the coal-steel concentrations of southwestern Pennsylvania. Johnstown is the Region's principal city and Somerset Borough is the local point of growth. These two Counties as a whole possess outstanding open space resources. Several State Parks are in or near this area, including Prince Gallitzen in Cambria and Laurel Hill in Somerset. The Laurel Highlands which span Somerset and Westmoreland and Fayette to the west is an area of high potential for recreation. The principal need in realizing the area's tourist potential is improved access.

Blair County has historically straddled the State's principal east-west transportation areteries; first the canals, then the railroad. Most of the County's growth is occurring in Altoona's suburban areas. One of

Altoona's most important assets is providing excellent rail access to Megalopolis and to the Midwest (See Figure 1-1 and Figure 3-5).

REGION 12

Region 12, the largest of Pennsylvania's thirteen Regions contains one of the State's two major urban complexes. The City of Pittsburgh (estimated population 569,000) located in Allegheny County (estimated total population 1,579,000) is the center of a six-County metropolitan area which includes surrounding Counties of Armstrong, Beaver, Butler, Washington and Westmoreland. These plus the three less urbanized Counties of Fayette, Greed and Indiana constitute Region 12.

While the population in most of Region 12 has continued to increase at a moderate rate during the past three decades, there has been continuing out-migration, only partly replaced by immigration. The City of Pittsburgh between 1950 and 1964 lost a population of approximately 120,000 people.

Since Pittsbrugh's founding over 200 years ago, the Region's physical development has tended to radiate along the major waterways of the Region, the Allegheny, Monongahela, and Ohio Rivers, which converge to form the Golden Triangle in the heart of the city. From the beginning of the automobile age, significant development has also occurred along the Region's major arterial highways extending from the City in all directions.

Population growth in the Pittsburgh area has been both concentric and radial. The direction of Pittsburgh's population growth pattern has been greatly influenced by the location of steel mills and supporting industries in corridors extending from the central city along major rail and water transportation systems. These corridors lead some distance into counties bordering Allegheny County and extend as far as Latrobe in Westmoreland County, Brownsville in Fayette County, Canonsburg in Washington County and Ellwood City in Lawrence County. In recent years, the development of new highways on top of the plateau has encouraged strip development there (See Figure 1-1 and Figure 3-2b).

Increases in market values of taxable real property between 1960 and 1964, an indication of small area population change, suggest continued growth along the river and highway corridors leading out from the City. To the northeast, such a corridor extends up the Beaver Valley and along Pa. Route 18 into Lawrence County; another extends as far as the City of Butler along Pa. Route 8, a third up the Allegheny River and U.S. 28 to Freeport. Perhaps the most extensive growth sector is that proceeding eastward between U.S. 22 and 30 as far as Latrobe. Somewhat less pronounced corridors extend southward along the Monongahela to Monesson and southwestward along U.S. 19 and the new I-79 to the City of Washington. There is some indication that the three southern communities in Indiana County have experienced more rapid growth since 1960. It is also apparent that as industry continues to decentralize outwards from Pittsburgh, urban development is tending to fill in the vacant lands between previously established radial corridors.

Despite the rule that people follow work opportunities, new jobs in the Commonwealth failed to halt migration out of the Region. In the first half of the 1960's, Region 12 lost 195,000 people (inclusive of the absolute decline of 80,000 and the 115,000 attributed to natural increase). Connelsville in Fayette County, since 1940 has had a population decline of 162,000 with predictions for further decline. Unemployment has plagued the area since the exhaustion of the Connellsville seam. In the Region's smallest county, Greene County, the town of Waynesburg is the focus of activity where half of the County's 767 manufacturing jobs are found (See Appendix D).

Urban renewal projects have provided Pittsburgh with new civic facilities, new industrial employment and the judicious blending of several land uses in a planned development district. Both the City's new $20 million auditorium in the Lower Hill district and 2,000 of today's manufacturing jobs owe their existance to land assembled and cleared by the Pittsburgh Urban Development Authority. The latter achievement was preceded by the establishment in 1964 of a Land Reserve Fund which has already cleared 458 acres for industrial expansion in six urban redevelopment projects. The $65 million Allegheny Center on the central north side combines a 13 acre two-level shopping plaza atop a 3,000 car parking garage with professional office buildings, 1,550 residential units, and new highway construction which will make this major in-town shopping center attractively accessible to the suburbs.

In the rest of Region 12, smaller urban centers have also undertaken numerous urban renewal programs but appear to have neglected the task of preparing comprehensive city plans. McKeesport, however, has a planning commission, a comprehensive plan and an active redevelopment authority. In addition, the City provides the primary leadership in the Mon-Yough Conference on Community Planning, a group of dedicated community leaders who have been promoting community development in the southeastern portion of Allegheny County since 1957. Perhaps for this reason, the McKeesport Redevelopment Authority has been very active in negotiating a major relocation of the railroad that now bisects its central business district to a new right-of-way outside the city (See Figure 1-1).

The Region's promising subject for a "systems" approach to recreation planning is the upper reaches of the Allegheny River. There is a danger that much of the recreation potential of the Allegheny River in Armstrong County may be lost if the proposed Allegheny Valley Expressway, from Pittsburgh to Kittanning, is constructed before this river resource is thoroughly studied. This highway improvement can be expected to accelerate urban and commercial development all along the River with the prospect that many of the best potential parks and river access areas may be lost if the highway construction is not coordinated with long-range recreation plans (See Figure 3-6).

Many of the Region's major highways follow the valleys, but they cannot be widened for modern traffic loads without displacing a very large number of older commercial, industrial and residential structures. Most new industries which desire to locate near Pittsburgh will find it necessary to locate on top of the high bluffs where open land is still available.

Intra-regional employment patterns illustrates both the growing economic interdependency within the Region and the unequal exchange of commuters between industrial counties. Only between Washington and Westmoreland Counties was the volume of daily commuters approximately equal in both directions.

Commuting patterns in Region 12 extend beyond regional and State boundaries. Allegheny County is an employment center for approximately 6,000 persons commuting from outside of Region 12.

Thus there exists some interaction between the Region and areas on its periphery. This relationship appears to be strongest between Region 12 and the Pennsylvania and Ohio Counties of Lawrence and Columbiana. Contrary to popular impressions, only slightly more than 10,000 of an estimated 81,000 total cross-county commuters traveled to jobs within the City of Pittsburgh (See Table E-1).

REGION 13

Region 13 is illustrative of a timely unequal population distribution. A third of the population is located in Erie, a third in Mercer and Lawrence, and the last third includes Warren, Crawford, Venango, and Forest.

Lawrence and Mercer are two counties in Region 13 located in the north-western portion of the State on the Ohio broder. The principal cities, Sharon and Farrell in Mercer and New Castle in Lawrence are closely related to each other economically and socially (See Figure 2-1). This complex is located approximately 85 miles south of Erie and 60 miles north of Pittsburgh. Commuting patterns and population development are interdependent among these cities as well as surrounding Allegheny, Beaver, Butler, Washington, and Westmoreland Counties.

None of the new expressways planned for this Region will directly serve Warren County and isolation will remain a problem for this area. In Erie, the further development of its port facilities might improve its competitive position among other Great Lakes ports. Because of Erie's history of skilled labor, attempts should be made to develop additional industrial land as well as recreation areas such as Presque Isle, the Pymatuning and Allegheny Reservoirs. The shortage of service industries is also quite evident in this area. The successful expansion of industry and recreation requires good radial access roads as inducement for companies to take advantage of the Region's potential. More specifically, the Region needs better diagonal highways which would run into the Allegheny National Forest and perhaps connect at DuBois, ultimately providing better access to the southeastern portion of the State.

APPENDIX F

SOME ELEMENTS OF THE PENNSYLVANIA CONSTITUTION WHICH ARE PERTINENT TO TRANSPORTATION DEVELOPMENT

The Constitution of the Commonwealth of Pennsylvania contains some sections which pertain to transportation financing, control, and improvement. Several of the most pertinent sections related to transportation are presented so that the reader can evaluate the existing restraints which would affect a PennDOT without appropriate constitutional revision.

Section 4. No debt shall be created by or on behalf of the State except to supply casual deficiencies or revenue, repel invasion, suppress insurrection, defend the State in war, or to pay existing debt; and the debt created to supply deficiencies in revenue shall never exceed in the aggregate at any one time, one million of dollars (Amendment No. 2 of 1923 simply changed the amount of bonds for road purposes from 50 millions to 100 millions of dollars.)

State Loans Restricted to Purpose

Section 5. All laws, authorizing the borrowing of money by and on behalf of the State, shall specify the purpose for which the money is to be used, and the money so borrowed shall be used for the purpose specified and no other.

State Credit Not to Be Pledged

Section 6. The credit of the Commonwealth shall not be pledged or loaned to any individual, company, corporation or association, nor shall the Commonwealth become a joint owner or stockholder in any company, association or corporation.

State Not to Assume Municipal Debts; Exceptions

Section 9. The Commonwealth shall not assume the debt, or any part thereof, of any city, county, borough or township, unless such debt shall have been contracted to enable the State to repel invasion, suppress domestic insurrection, defend itself in time of war, or to assist the State in the discharge of any portion of its present indebtedness.

Toll Bridges

[1] Section 16. In addition to the purposes stated in article nine, section four, of this Constitution, the General Assembly may provide, by law, for the issue of bonds, to the amount of ten millions of dollars, for the purpose of acquiring toll bridges, and may, by law, provide that, upon the acquisition of any such bridge, tolls may be charged for the use thereof, sufficient to pay the interest and sinking fund charges on such bonds and the cost of the maintenance of such bridges, until the bonds issued have been retired and such bridges are freed of tolls. (Amendment of November 7, 1933.)

Authorization of State to Borrow Money

[1] Section 17. The Governor, the Auditor General, and the State Treasurer, immediately upon the adoption of this amendment by the electors, may borrow an amount not exceeding twenty-five million dollars to defray the expenses of the State government for the biennium beginning June first, one thousand nine hundred thirty-three; provided the General Assembly, at its regular session of one thousand nine hundred thirty-three, has authorized the borrowing of money for this purpose. (Amendment of November 7, 1933.)

Gasoline Taxes and Motor License Fees Restricted

[1] Section 18. All proceeds from gasoline and other motor fuel excise taxes, motor vehicle registration fees and license taxes, operators' license fees and other excise taxes imposed on products used in motor transportation after providing therefrom for (a) cost of administration and collection, (b) payment of obligations incurred in the construction and reconstruction of public highways and bridges shall be appropriated by the General Assembly to agencies of the State or political subdivisions thereof; and used solely for construction, reconstruction, maintenance and repair of and safety on public highways and bridges and air navigation facilities and costs and expenses incident thereto, and for the payment of obligations incurred for such purposes, and shall not be diverted by transfer or otherwise to any other purpose, except that loans may be made by the State from the proceeds of such taxes and fees for a single period not exceeding eight months, but no such loan shall be made within the period of one year from any preceding loan, and every loan made in any fiscal year shall be repayable within one month after the beginning of the next fiscal year. (Amendment of November 6, 1945.)

Special Assessment for Transit Facilities in Philadelphia

[2] Section 19. The city of Philadelphia, in constructing, for the benefit of the inhabitants thereof, transit subways, rapid transit railways, or other local transit facilities for the transportation of persons or property, shall have the power, in order the more justly to distribute the benefits and costs of such transit facilities, to levy special assessments against such properties, whether abutting or not abutting upon said transit facilities, as are or will be specially and particularly benefited by the construction or operation of such transit facilities; such power to be exercised in accordance with existing or with future laws or pursuant to statutes enacted prior to the adoption of this amendment but made effective by it. Such special assessments, when so levied, may be made payable presently when levied or in installments over a period of years, with or without interest, and shall immediately, when so levied, be deducted from any indebtedness incurred for such purposes in calculating the debt of such city. Such city may acquire by eminent domain either the fee or less estate or easements in land necessary for the construction or operation of such transit facilities or for the disposal of earth or material excavated in the construction thereof or for other incidental purposes; but this provision shall not create any additional powers for the condemnation of any railroad or street railway in operation. (Amendment of November 7, 1933.)

Bonds Authorized for Special Purposes

[2] Section 21. In addition to the purposes stated in article nine, section four of this Constitution the Commonwealth may be authorized by law to create debt and to issue bonds to the amount of fifty million dollars ($50,000,000) for the construction of public buildings, highways, drainage and sanitary systems, anti-stream pollution and flood control projects for purposes of reforestation, and for the rehabilitation and hospitalization of war veterans.

ARTICLE XV

CITIES AND CITY CHARTERS

Acquisition of Land for Highway Construction

[1] Section 5. The General Assembly may authorize cities to take more land and property than is needed for actual construction in the laying out, widening, extending or relocating highways or streets connecting with bridges crossing streams or tunnels under streams which form boundaries between this and any other state, but the additional land and property, so authorized to be taken, shall not be more than sufficient to form suitable building sites on such highways or streets. Nor shall the authority hereby conferred be exercised in connection with the laying out, widening, extending or relocating of any highway or street at a point more than three miles distant from the approach to any such bridge or tunnel. After so much of the land and property has been appropriated for such highways or streets as is needed therefor, the remainder may be sold or leased and any restrictions imposed thereupon which will preserve or enhance the benefit to the public of the property actually needed for the aforesaid public use. (Amendment of November 7, 1933.)

ARTICLE XVII

RAILROADS AND CANALS

To Be Public Highways and Common Carriers

Section 1. All railroads and canals shall be public highways, and all railroad and canal companies shall be common carriers. Any association or corporation organized for the purpose shall have the right to construct and operate a railroad between any points within this State, and to connect at the State line with railroads of other States. Every railroad company shall have the right with its road to intersect, connect with or cross any other railroad; and shall receive and transport each the other's passengers, tonnage and cars loaded or empty, without delay or discrimination

Stock Transfer Companies; Books

Section 2. Every railroad and canal corporation organized in this State shall maintain an office therein where transfers of its stock shall be made and where its books shall be kept for inspection by any stockholder or creditor of such corporation, in which shall be recorded the amount of capital stock subscribed or paid in and by whom, the names of the owners of its stock and the amounts owned by them, respectively, the transfers of said stock and the names and places of residence of its officers.

Equal Transportation Rights

[1] Section 3. All individuals, associations and corporations shall have equal rights to have persons and property transported over railroads and canals, and no undue or unreasonable discrimination shall be made in charges for, or in facilities for, transportation of freight or passengers within the State or coming from or going to any other State. (Amendment of November 7, 1933.)

Consolidation Prohibited; Restrictions on Officers

Section 4. No railroad, canal or other corporation or the lessees, purchasers or managers of any railroad or canal corporation, shall consolidate the stock, property or franchises of such a corporation with, or lease, or purchase the works or franchises of, or in any way control any other railroad or canal corporation owning or having under its control a parallel or competing line, nor shall any officer of such railroad or canal corporation act as an officer of any other railroad or canal corporation owning or having the control of a parallel or competing line; and the question whether railroads or canals are parallel or competing lines shall, when demanded by the party complainant, be decided by a jury as in other civil issues.

Limitation of Powers

Section 5. No incorporated company doing the business of a common carrier shall, directly or indirectly, prosecute or engage in mining or manufacturing articles for transportation over its works, nor shall such company, directly or indirectly, engage in any other business than that of common carriers, or hold or acquire lands, freehold or leasehold, directly or indirectly, except such as shall be necessary for carrying on its business; but any mining or manufacturing company may carry the products of its mines and manufactories on its railroad or canal not exceeding fifty miles in length.

Personnel Not to Be Interested in Contracts

Section 6. No president, director, officer, agent or employee of any railroad or canal company shall be interested, directly or indirectly, in the furnishing of material or supplies to such company, or in the business of transportation as a common carrier of freight or passengers over the works owned, leased, controlled or worked by such company.

Discriminations and Preferences Forbidden

Section 7. No discrimination in charges or facilities for transportation shall be made between transportation companies and individuals or in favor of either, by abatement, drawback or otherwise, and no railroad or canal company, or any lessee, manager or employee thereof, shall make any preferences in furnishing cars or motive power.

Granting of Passes Limited

[2] Section 8. No railroad, railway, or other transportation company shall grant free passes or passes at a discount to any person except officers or employes of the company and clergymen. (Amendment of November 6, 1923.)

Construction of Street Railways

Section 9. No street passenger railway shall be constructed within the limits of any city, borough or township, without the consent of its local authorities.

Acceptance of This Article

Section 10. No railroad, canal or other transportation company, in existence at the time of the adoption of this article, shall have the benefit of any future legislation by general or special laws, except on condition of complete acceptance of all the provisions of this article.

Duties of Secretary of Internal Affairs

Section 11. The existing powers and duties of the Auditor General in regard to railroads, canals and other transportation companies, except as to their accounts, are hereby transferred to the Secretary of Internal Affairs, who shall have a general supervision over them, subject to such regulations and alterations as shall be provided by law; and, in addition to the annual reports now required to be made, said Secretary may require special reports at any time upon any subject relating to the business of said companies from any officer or officers thereof.

Enforcement

Section 12. The General Assembly shall enforce by appropriate legislation the provisions of this article.

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[1] *The Amendment to Section 3 of Article 17 as given above was adopted by a vote of the people November 7, 1933. The section previously read as follows:*

Section 3. All individuals, associations and corporations shall have the equal right to have persons and property transported over railroads and canals, and no undue or unreasonable discrimination shall be made in charges for, or in facilities for, transportation of freight or passengers within the State or coming from or going to any other State. Persons and property transported over any railroad shall be delivered at any station at charges not exceeding the charges for transportation of persons and property of the same class in the same direction to any more distant station; but excursion and commutation tickets may be issued at special rates.

[2] *The Amendment to Section 8 of Article 17, as given above was adopted by a vote of the people on November 6, 1923. The section previously read as follows:*

Section 8. No railroad, railway or other transportation company shall grant free passes, or passes at a discount to any person except officers or employes of the company.

ARTICLE VIII

TAXATION AND FINANCE

Section 8. The debt of any county, city, borough, township, school district, or other municipality or incorporated district, except as provided herein, and in section fifteen of this article, shall never exceed fifteen (15) per centum upon the assessed value of the taxable property therein, nor shall any such county, municipality or district incur any debt, or increase its indebtedness to an amount exceeding five (5) per centum upon such assessed valuation of property, without the consent of the electors thereof at a public election in such manner as shall be provided by law. The debt of the city of Philadelphia may be increased in such amount that the total debt of said city shall not exceed thirteen and one-half (13 1/2) per centum of the average of the annual assessed valuations of the taxable realty therein, during the ten years immediately preceding the year in which such increase is made, but said city shall not increase its indebtedness to an amount exceeding three (3) per centum upon such average assessed valuation of realty, without the consent of the electors thereof at a public election held in such manner as shall be provided by law. No debt shall be incurred by, or on behalf of, the county of Philadelphia.

In ascertaining the debt-incurring capacity of the city of Philadelphia at any time, there shall be deducted from the debt of said city so much of such debt as shall have been incurred, or is about to be incurred, and the proceeds thereof expended, or about to be expended, upon any public improvement, or in construction, purchase, or condemnation of any public utility, or part thereof, or facility therefor, if such public improvement or public utility, or part thereof, or facility therefor, whether separately, or in connection with any other public improvement or public utility, or part thereof, or facility therefor, may reasonably be expected to yield revenue in excess of operating expenses sufficient to pay the interest and sinking fund charges thereon. The method of determining such amount, so to be deducted, shall be as now prescribed, or which may hereafter be prescribed by the General Assembly.

In incurring indebtedness for any purpose the city of Philadelphia may issue its obligations maturing not later than fifty (50) years from the date thereof, with provision for a sinking fund to be in equal or graded annual or other periodical installments. Where any indebtedness shall be or shall have been incurred by said city of Philadelphia for the purpose of the construction or improvement of public works or utilities of any character, from which income or revenue is to be derived by said city, or for the reclamation of land to be used in the construction of wharves or docks owned or to be owned by said city, such obligations may be in an amount sufficient to provide for, and may include the amount of, the interest and sinking fund charges accruing and which may accrue thereon throughout the period of construction, and until the expiration of one year after the completion of the work for which said indebtedness shall have been incurred; and said city shall not be required to levy a tax to pay said interest and sinking fund charges as required by section ten of this article until the expiration of said period of one year after the completion of said work. (Amendment of May 17, 1966).

* * *

Section 25. In addition to the purposes stated in article nine, section four of this Constitution, the Commonwealth may be authorized by law to create a debt and issue bonds in the amount of five hundred million dollars ($500,000,000) for a Land and Water Conservation and Reclamation Fund to be used for the conservation and reclamation of land and water resources of the Commonwealth, including the elimination of acid mine drainage, sewage, and other pollution from the streams of the Commonwealth, the provision of State financial assistance to political subdivisions and municipal authorities of the Commonwealth of Pennsylvania for the construction of sewage treatment plants, the restoration of abandoned strip-mined areas, the control and extinguishment of surface and underground mine fires, the alleviation and prevention of subsidence resulting from mining operations, and the acquisition of additional lands and the reclamation and development of park and recreational lands acquired pursuant to the authority of article nine, section twenty-four of this Constitution, subject to such conditions and liabilities as the General Assembly may prescribe. (Added by Amendment of May 16, 1967).

ARTICLE IX

LOCAL GOVERNMENT

Note: Whereas the former Article IX, Taxation and Finance became Article VIII (see above), Article IX was reserved for the subject of Local Government by Governor's Proclamation of July 7, 1967, such subject to be considered by the Constitutional Convention December 1967 January-February 1968.

APPENDIX G

A SUGGESTED MANAGEMENT-INFORMATION SYSTEM TO SUPPORT THE STATE DEPARTMENT OF TRANSPORTATION

Introduction

There will be a need to design an automated information management system to support the new Department of Transportation for the State of Pennsylvania. Such a system has two major component structures: (1) a Data Storage Design, and (2) a Data Processing Design.

The first component, the data storage design, consists of a file structure and an item coding system. These sub-structures must satisfy two requirements: (1) they must be flexible, allowing for growth in both the depth and breadth of data which can be incorporated into the system, and (2) they must be definitive of the data in the system in the sense that data elements can be located, identified, and related to each other through these sub-structures.

The second component, the data processing design, consists of a program design for input, output, and computational operations. This program design must also satisfy two requirements: (1) the design must be flexible in that it does not artificially restrict the full data-handling capabilities of the storage design, and (2) the design must facilitate direct on-line manipulation of data, minimizing operations necessary to maintain man-machine communication.

This appendix will treat each of these components of an information system in detail and propose a systems design for implementation by the Department of Transportation in Pennsylvania.

Data Storage Design

The purpose of a file structure and code design is to classify and allocate storage for elements of data. If effective, the methods of classification and storage allocation provide certain information about each data element. In a simplified design, this information may only be the identification of a storage location by which the data element can be accessed. In a more sophisticated design, this information may detail certain characteristics of the data element itself. Ideally, the file identification and code design of each data element sufficiently define that data element so that all generic and specific search inquiries may be answered by referencing these codes alone. The information provided by such a data storage design is as follows:

(1) Unique Item Identification
By this is meant cataloguing each data element in such a way that any two different elements of information may be differentiated and the meaning of each uniquely determined.

(2) Item Scope Identification
By this is meant, cataloguing each data element in such a way that any two elements referencing different groups of beings or things may be differentiated and each uniquely identified, for example, total population for Philadelphia as compared to total population for Center City Philadelphia.

(3) Generic Item Categories
By this is meant cataloguing each data element in such a way that relations between the meanings of elements can be identified and the types of relations determined.

The system proposed by this study will detail a file structure and coding scheme which attempts to provide all the information for data elements mentioned above, and which, in addition, is flexible enough to accomodate a wide variety of elements.

1. File Structure

A major consideration in any information management system is that of file organization and structure. Since this system is to support the Department of Transportation, the file structure and organization must be such that it is most adaptable to transportation data.

All data relevant to transportation research, planning, and analysis can be divided into two categories: (1) Data describing the population, land use, and economic activity of certain designated geographical areas, and (2) Data describing characteristics and capabilities of certain existing or proposed transportation networks. In the first case, all data is based upon zonal divisions of a certain geographical area, and, in the second case, data is based upon a network of links and nodes superimposed upon this geographical area. This permits a very natural division of available data into two separate files, the first containing data about geographical areas and the second containing data about transportation networks. Consideration had been given to structuring a single file of nodes (or zones) and links which would view all transportation networks as one or a set of links connecting different zone pairs. It was decided however, that much greater flexibility is maintained by keeping network description and structure independent of zone definitions used for statistical analysis. In this way, data from any number of different zones varying in size and detail of description may be used to determine impact on a given network and comparisons made. More important, the definition of zones desired to measure socio-economic statistics is often quite inconsistent with the zones (or nodes) necessary to adequately describe a network for a given mode of transportation. Highways, for instance, represent a much more complicated system of links and intersections than can be represented by simple connections between geographical areas. Because of these considerations, network analysis data has been separated from geographical statistical data. Of course, network analysis can be done on the basis of zone to zone link pairs, but the separation of the two allows greater flexibility when this is not desirable.

The proposed systems design consists of two major data files and four supporting reference files. The two data files store all the data elements in the system. The four supporting files contain no actual data elements. They are reference and descriptive files used to identify and relate pieces of data as they are stored in the data base.

A. Data Files

The two data files are the Zone Element File and the Network Element File. The first file consists of all data elements which are descriptive of the socio-economic characteristics of different geographic areas. The second file consists of all data elements descriptive of any proposed or existing transportation network. An entry in either file consists of a data element description, a data value, and an element code number. The data element description is simply an alphanumeric description of the particular data element in the file, which can be used for identification and labeling on printouts or display. The data value is the information element itself, and must be stored in such a way that it can be combined with other data values and employed in various computational analyses. The element code references entries in each of the supporting files. It is through these files that each data element can be uniquely identified and related to other elements in the system. The information about each data element which is identified by these supporting reference files is discussed below. The manner in which they are referenced is discussed with the code structure.

B. Supporting Reference Files

There are four supporting files incorporated into the systems design. Two of these files provide the Item Scope Identification (see Page G-2), a third provides the Unique Item Identification and Generic Item Categories, and a fourth provides source information for each data element.

1. Zone Reference File

The first file mentioned above is the Zone Reference File. Each data element in the Zone Element File references an entry in the Zone Reference File. The Zone Element File, as has been discussed, stores all socio-economic data which is descriptive of some geographic area. Since socio-economic data is not based upon any consistent geographical land divisions, provisions must be made in the systems design for the inclusion of socio-economic data based upon any arbitrary sub-division of a given area. The purpose of the Zone Reference File is to make it possible to define any partition of a given geographical area, and then to relate this partition to any other previously defined. In this way, a data element simply references the particular partition and sub-section of that partition about which it is concerned. This sub-section is defined in the reference file, and all other geographical areas which contain this area or are contained within it can be identified.

With such a reference file, the data manipulation capabilities of the system are greatly increased. Being able to automatically define and relate geographical sub-divisions allows the system to do much more than perform a simple one to one match between requested and available information. The system can now, to a certain extent, *evaluate* data inquiries, and, through this evaluation, identify identical information stored in a number of different ways. A request for population of a given county, for example, is available if any of the following data elements are available:

1) Population by Minor Civil Division
2) Population by County
3) Population by Census Tract

The system can now identify these relationships and provide the requested information either directly by county, or by summing over civil divisions or census tracts in a county. The system can also approximate information when it is not available in any of these or similar forms. For instance, it can recognize areas which are slightly larger or smaller than the one desired and provide information for those areas as at least an approximation for data not directly available. In this way, the user need not specify previously all possible forms in which the requested information may be available, for the system is able to perform this task for him, whenever necessary.

A detailed description of the Zone Reference File and the techniques by which the zones are matched and related is provided in Appendix G-1.

2. *Network Description File*

The second reference file employed by the system is the Network Description File. Each element in the Network Element File references an entry in this file. Just as the Zone Reference File allowed the system to store and reference data based upon any arbitrary sub-divisioning of a geographic area, so the Network Description File allows the system to store and reference data descriptive of any arbitrary transportation network.

Any network consists of a system of nodes and links. In simple analyses, the nodes may represent large urban areas and the links single corridors of traffic between areas. In more detailed analyses, the nodes are point locations designating intersections, bottlenecks, terminals, etc., while the links are single rails lines, roads, etc., connecting these nodes. Thus, to completely describe any transportation network, the system must be able to incorporate data at all levels of detail, relating specific locations, when necessary, to the larger zones defined by the Zone Reference File.

The Network Description File is divided into two sections: (1) Node Descriptions, and (2) Link Descriptions. The Node Descriptions incorporate three sub-files, each identifying terminals, intersections, and bottlenecks, respectively. These categories are mutually exclusive as defined. Terminals are points at which changes of mode are possible and facilities for accomodating these changes are available. Intersections are points where two or more links of a single node meet but no change of mode of travel is possible. Bottlenecks are points along *single* links where traffic flow is affected by changes in link characteristics but not because of interaction with any other link.

When data about any terminal, intersection, and/or bottleneck is to be stored in the data base, code numbers are assigned to each and this code number along with an alphanumeric description or identification is stored in the appropriate Network Description File sub-section, and this identification may be referenced for printout purposes at any time. Capability is also provided by the coding system to relate any of these specific node identifications to the zonal areas defined by the Zone Reference File. When no specific point location is desired and traffic is being analyzed only on the basis of inter-zonal flow, special codes are provided in each sub-file to relate the node directly to a proper zone definition in the Zone Reference File.

The Link Descriptions in the Network Description File consist of alphanumeric identifications and corresponding code numbers which name possible traffic links between the nodes defined by the Node Descriptions. The five major sub-divisions of this file are as follows:

1. Rail
2. Air
3. Highway
4. Waterway
5. Pipeline

Specific link identifications such as two-lane highway, single rail track, etc., are listed for each mode of transportation and code numbers assigned to each.

The Zone Reference and Network Description Files can accomodate any network data. Links can be defined independent of geographical location and be referenced by general descriptive data, or very specific locations can be assigned to these links to be referenced by data characteristic of only a particular section of a given network. Nodes can vary from large geographical areas to specific point locations, and types of nodes can be differentiated in terms of their relationship to the overall network. Also, these different types of nodes (terminals, intersections, and bottlenecks) can also be referenced independent of geographical location when the data to be identified is of a more general nature. Nodes are located by means of the Zone Reference File, therefore, the same flexibility found in relating zones is possible for comparing and relating link locations.

Thus, the system increases its data handling capabilities by keeping separate files defining location, nodes and links. Each can be described separately or combined as necessary to detail network characteristics. There are no restrictions as to the generality or specificity of data permitted. A corridor of traffic between two urban areas can be described, a two-lane highway, a bus terminal, an airport, or in detail, a two-lane highway between a particular bus terminal and a specific airport at specified locations. The list of nodes and links can be added to as necessary as new data is incorporated into the system.

3. *Element Reference File*

The third reference file is the Element Reference File. This file serves two purposes: (1) it serves as a library look-up for certain data element descriptions and (2) it stores a hierarchical structure of the data elements in the system. The data element descriptions stored in this file are the interpretations for both the Inner Category Codes and the Units Designation Codes. The purpose of these codes will be discussed in detail with the coding structure. The hierarchical structure stored in this file establishes generic categories for a section of the Element Meaning Code. This code will also be discussed in detail later. At this point, it is sufficient to note that a matrix is maintained in the Element Reference File which identifies for each meaning code all other codes for which the given element is generic in meaning. For instance, a data element describing total population for a given area is generic to such elements as total white population and total work force for the same area. These generic categories for each data element can be determined by referencing this hierarchical structure stored in the Element Reference File.

4. *Source Agency File*

The last reference file is the Source Agency File. This file is optional and not part of the basic systems design. If included, this file would list the agency as well as the document and/or file source for each data element. Included with this data may also be such information as date of source document and possibly indications of whether data was surveyed, projected, etc., and any other such information as considered appropriate for inclusion. Each data item would reference the appropriate source information in this file through a code number.

2. Code Design

The file design described consists of both data files and supporting reference files. The data files contain all the data elements, and the reference files contain all information necessary to identify each data element and establish relationships between elements. The manner in which the two sets of files are related and appropriate items from each matched together is through the Information Element Code assigned to each data element upon entry into the system.

A. Information Element Code

The Information Element Code is divided into three separate parts: the first part is the Scope Identifier, the second the Source Identifier, and the third the Element Meaning Identifier.

1. Scope Identifier

The Scope Identifier, the first part of the Information Element Code is a five-part code. These parts are pictured in the diagram below:

Scope Identifier

(1)	(2)	(3)	(4)	(5)
Zone	Node	Link	Zone	Node

Each sub-part is used to identify an entry in either the Zone Reference File or the Network Description File. Sub-parts (1) and (4) refer to entries in the Zone Reference File and sub-parts (2), (3), and (5) refer to entries in the Network Discription File. If each of the reference files is assigned a file number and each of its entries assigned a unique identification number (which may simply be a sequential numbering of all entries in each file), then each of these sub-parts can reference appropriate entries by simply identifying the file number and item-entry number of the desired file reference.

If a data element describes a particular geographical area, the appropriate reference in the Zone Reference File is given by the first sub-part. If a node is described, the second sub-part references the appropriate entry in the Node Descriptions of the Network Description File. In addition, an entry in the first sub-part locates that node in terms of one of the geographical areas given by the Zone Reference File. If a link is being described, the third sub-part identifies an entry in the Link Description of the Network Description File. Finally, if a specific link between two given nodes is described, all five sub-parts are employed, the first and second sub-part identifying the first node and its location, the third sub-part identifies the appropriate link, and the fourth and fifth sub-part identify the second node and its location.

A diagram depicting the different possibilities for scope identification is given below indicating for each the references necessary in each sub-part to identify the scope for that data element:

	Scope Identification				
Reference File	Zone	Node	Link	Zone	Node
Sub-part	1	2	3	4	5
Zone Description	✓				
Node Description	✓	✓			
Link Description			✓		
Link from One Node	✓	✓	✓		
Link between Two Zones	✓		✓	✓	
Link between Two Nodes (not located)		✓	✓		✓
Link between Two Nodes (located)	✓	✓	✓	✓	✓

Thus, for each element, the scope of the element is completely determined by the Scope Identifier. There is virtually no limit to the possible scope identifiers, since entries in each of the reference files may be added to as necessary. In addition, many possibilities exist, as can be seen by the table, as to the detail possible in describing various combinations of zones, nodes, links, and node-link pairs. Careful study of the table will indicate that even further possibilities exist which have not been detailed.

2. *Source Identifier*

The second part of the Information Element Code is the Source Identifier. This part references an entry in the Source Reference File which, in turn, identifies all relevant source information about that element.

Again, if each entry in the Source Reference File is assigned a sequential number and the file given an identification number, this reference can be made by designating the file and entry sequence number.

3. *Element Meaning Identifier*

The final part of the Information Element Code is the Element Meaning Identification. This code is used to generically catalogue and uniquely identify each data element in the system. The code is divided into four sub-parts. These sub-parts are depicted as follows:

Element Meaning Identification

Years Designation	Units Designation	Inner-Category Identification	Generic Category Identification

The Years Designation is used to designate the year for which the data element is descriptive. Population figures projected to 1970, 1975, and 1980 would each contain an appropriate year designation to indicate those years the data element is intended to describe.

The Units Designation indicates the units in which the data element is measured. A tentative list of Unit Designations is given in Table G-1. It should be noted that the list can be added to and revised as necessary. Each designation need only be assigned a unique identification number, and this number referenced by the Information Element Code. A table look-up for the appropriate measure assigned to each identification number is stored in the Element Reference File, and may be referenced at any time for printout and display purposes.

The Inner-Category Identification is used to identify specific *mutually exclusive* classification categories, such as religious affiliations, commodity codes, industrial classification codes, occupational classifications, etc. These are used to avoid cluttering generic categories with great detail and, yet, to allow identification of these specific categories within the coding system. Of course, only one breakdown in each category is permitted or at least mutually exclusive breakdowns with mutually exclusive sub-categories. This is to avoid the generation of generic classifications within this code. Any code which cannot be defined in this manner must be incorporated into the Generic-Category Identification code.

A tentative listing of the Inner-Category Identification is given in Table G-1. Again, a library look-up is stored in the Element Reference File for printout and display purposes. References to this library can also be made by file and item-entry number as with the other reference files.

The final section of the Element Meaning Identification code is the Generic-Category Identification. This code when taken with the other three sub-parts of the Element Meaning Identification uniquely identifies the meaning of each data element (meaning in this sense does not include scope identification). A tentative list of Generic-Item Categories arranged in a hierarchical structure is given in Table G-1. This list is used as the basis for element classification. Each item in the list can be assigned an arbitrary number. This number need not bear any relation to the hierarchical structure of the list. In this way, the list and the generic relation among elements can be completely redefined without affecting the numbers assigned to different information elements. As elements are incorporated into the system, they are assigned a number from the list. If no entry in the list exists which satisfactorily identifies the new element, the list is revised as necessary and a new entry and number added to the list in the appropriate section of the hierarchy. Any two elements which are identical except for possible different entries in the other subsections of the meaning code and/or scope code, are assigned the same Generic-Category Identification number and only elements fulfilling those requirements can be assigned the same Generic-Category Identification number.

Since for purposes of flexibility and generality of application, the numbers bear no relation to the hierarchical structure of the list, a table must be maintained within the system to identify the hierarchical structure defined by the data elements. Such a table contains for each element, the Generic-Category Identifications of all other elements for which the given element is classified as being generic by the hierarchical structure. In this way, generic and sub-categories of elements for any given data element can be determined by searching this list. It is this matrix determining the hierarchical structure of the generic categories which is stored in the Element Reference File.

The preclusion of any pre-set hierarchical structure incorporated into the code numbers themselves adds a great deal of flexibility to the system. New elements which do not fit into any of the present categories can now easily be incorporated into the system by simply adding new entries in the hierarchy and/or redefining the hierarchical relationships. When this is necessary, the codes previously assigned to each data element remain unaltered, and only the table defining the relationships between elements need be revised. A hard copy of the hierarchical structure and code numbers of entries as presently defined is always maintained for reference. In this way, new elements may be coded within this structure and appropriate entries in the system's hierarchical table added quite easily.

An initial hierarchical structure of data elements is given in Table G-1.

In order to indicate the separate parts of the Information Element Code with appropriate sub-parts more clearly, the following diagram outlines the Information Element Code structure:

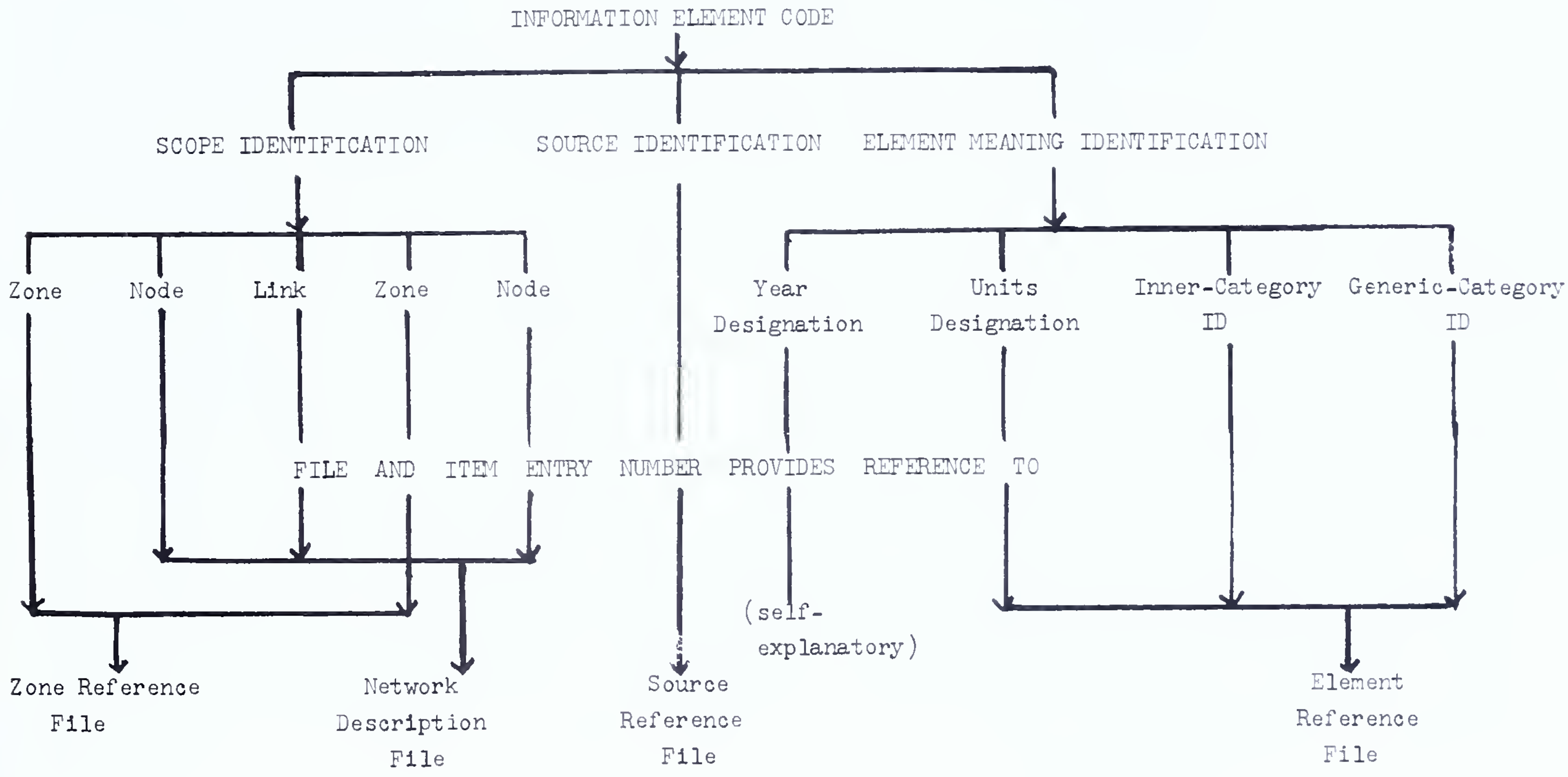

Table G-1

Data Element Structure

I. Unit Designation Codes

- 000 Not Applicable
- 100 Number
  - 101 Dollars
  - 102 Hours
  - 103 Days
  - 104 Months
  - 105 Miles
  - 106 Acres
  - 107 Years
  - ---
  - ---
- 200 Percent
  - 201 Dollars
  - 202 Hours
  - 203 Days
  - 204 Months
  - 205 Miles
  - 206 Acres
  - 207 Years
  - ---
  - ---
- 300 Rate
  - 301 Dollars/Mile
  - 302 Miles/Hour
  - 303 Dollars/Year
  - ---
  - ---
- ---
- ---

II. Inner-Category Code

- 100 Standard Commodity Code
  - 101 Farm Products
  - 108 Forrest Products
  - 109 Fresh Fish and Other Marine Products
  - ---
  - ---

- 200 Religious Affiliation
  - 210 Catholic
  - 220 Protestant
  - 230 Jewish
  - ---
  - ---

- 300 Body Type Trucks
  - 311 Panel
  - 312 Pickup
  - ---
  - ---

- ---
- ---
- ---

III. Generic Category Identification

- Population
  - Total
    - *Births*
    - *Deaths*
  - Sex
  - Religion
  - Age

  - Employment
  - Income
- Land Use
  - Residential
  - Industrial
  - Agriculture
  - Commercial
  - Parks and Recreations
  - Natural Resources
- Economic Activity
  - Industry
  - Agriculture
  - Business and Trade
  - Banking and Finance
  - Manufacturing
  - Construction
  - Transportation
- Network
  - Identification
  - Type
  - Time
    - *Delay*
      - Departure
    - *Transfer*
    - *Travel*
    - *Access*
    - *Egress*
  - Cost
    - *Travel*
    - *Access*
    - *Egress*
    - *Construction*
    - *Maintenance*

- Characteristics
    - *Safety*
        - Devices
            - Identification
            - Number
            - Location
    - *Comfort*
    - *Reliability of Service*
    - *Transfers*
    - *Delays*
    - *Construction*
    - *Maintenance*
    - *Access*
    - *Egress*
    - *Travel*
    - *Capacity*
    - *Volume*

- Trip Data
    - *Origin*
    - *Destination*
    - *Purpose*
    - *Route*
    - *Cost*
    - *Delay*

Data Processing Design

With the file structure and coding system designed, the next step is to outline input, output, and data processing routines which enable one to utilize to the full extent possible the full capabilities of the system. A flexible, generally-applicable file structure and code design are basic to any information system——they provide the basic structure within which information can be identified, related, and retrieved. They represent, however, for the most part, wasted effort, if the user cannot, with the minimum of effort, perform such information handling operations as are necessary to meet his data requirements. A wall of complicated coding techniques, symbol interpretations, and, in short, magic hand-waving methods built up around a well-equipped, complete data base structure, turn a potentially high-powered information system into nothing more than a black box whose contents remain virtually unknown and, therefore, of no practical use.

The key concepts in the designation and structure of necessary executive routines are flexibility and facility. The user must be able to search, process, and retrieve information with as few restrictions as possible either as to the breadth and depth of data desired, or as to the manner in which it is combined and processed, or as to the order and format in which displayed, and he must be able to do all this in a fairly simple manner with the minimum expenditure of effort and time. The extent to which the systems design can meet these requirements, is the extent to which the data base can become an active, powerful tool in support of transportation planning, research, and analysis.

The program design for the system should be built upon modular programming techniques, that is, the executive routines should consist of one main monitor program and many subprograms each designed to perform a particular input, output on data processing operation. The monitor program exercises control over the subprograms, choosing certain ones, and sequencing them properly in order to meet the processing needs of the user.

The modular subprograms lend a great deal of flexibility to the system. New modules may be added as necessary, old ones revised or deleted and no major revision in either the coding or the structure of the rest of the system is necessary. In addition, these modules may be executed in numerous combinations and sequences, thereby providing many more operational capabilities than would be possible with more strictly confined sequences and choices of operations. When user requirements repeatedly call for certain operational sequences, these may be incorporated into separate modules, thereby eliminating the need for specifying sequences and operations for these frequently requested applications.

Modular operations necessary to provide flexibility and generality fall into the following categories:

- Search and Retrieve
- Analyze
  - Compare
  - Compute
  - Correlate
  - Project
- Update
- Format and Display

The search and retrieve modules provide capabilities for identifying and accessing particular elements or groups of elements. Options must exist, naturally, for requesting either particular elements or elements relating to particular topics, zones, or networks. In addition, these program modules should allow the user the specify options which cross-check data available in multiple forms and/or at multiple sources. The data storage design provides capabilities for numerous search and retrieve options, and program modules designed to provide all such options should be added to the program package as dictated by the demands and needs of the users over a period of time.

> The second groups of modules is designed to handle all manipulations performed on actual data values, and would include comparisons, computations, correlations, and projections. This group of modules can incorporate quite sophisticated analytical techniques, if desired. Trip generation models, modal split models and numerous other analytical techniques can be included in the system through this modular subprogram structure.

The updating modules are used to revise existing data and to incorporate new data into the system. The new or change data can be the result of computational analyses within the system (i.e., the results of employing one or more of the analytical modules) or it can also be received directly through the input channels. Provisions for single entry and mass inputs must be provided, as well as library file updates to accommodate new data entries.

The format and display modules organize and sequence output data according to specifications indicated by the user and then transmit this data through the proper output channel.

The modular programming techniques, as have been discussed, incorporate a great deal of flexibility into the system's structure and, in effect, it's capabilities. With such techniques, however, many options are left to the user and, therefore, must be specified by him in advance. In such a system, it becomes increasingly important that the user can easily communicate to the machine the proper sequence of operations and processing options which are available to him. Whereas the number and kinds of modular sub-programs determined the flexibility of the system, it is the design of the main monitor program which determines the facility with which the system can be operated. The monitor program must be able to display for the user a list of the options available to him at any point in the machine's operation. These must be clearly stated in language he can understand and the manner in which he must specify his choices should also be clearly outlined and kept as simple as possible.

This type of system has two major advantages. First, by on-line monitoring of each operation, the user can change any subsequent sequence of processing as a result of earlier ones. He can decide to record partial results and he can halt operations at any time. This is especially helpful when the user is searching out general, ill-defined categories of data and depending upon the available data may desire to alter his processing operations. The second major advantage is that the facility with which the man and machine can exchange information makes the machine a much more readily available tool at the user's disposal, and, therefore, of much more value to him. Not hampered by prohibitive coding and pre-processing operations, the user makes much freer, and most likely, more frequent use of the machine's full capabilities.

Summary

The system described attempts to meet all four requirements defined at the beginning of this appendix. The coding system and zone-network storage design make it possible to store any data pertaining to any network or geographical area. The geographical areas have been defined so that the system can automatically relate these areas to each other in terms of inclusion and equivalence. The nodes, because they are defined in terms of these areas, have similar properties. The coding system permits generic relations between elements to be defined and automatically interpreted. Because of these properties, the system can automatically handle inquiries concerning existence of certain information in the data base as well as define and retrieve related categories of information.

The modular programming techniques give great flexibility to the kinds and modes of operations possible within the system, and the on-line direct communications between man and machine make the capabilities of the process immediately and easily available to the system's user.

APPENDIX G-1

STRUCTURE OF THE ZONE REFERENCE FILE

The structure of the Zone Reference File is quite flexible and can easily be adapted to other information management structures which depend upon the multi-partitioning of given entities and then defining the relationships which exist between different partitions. In this system, the entities to be divided are the geographical areas within and surrounding the State of Pennsylvania, and the relationships to be defined are those of inclusion and containment. In other words, socio-economic data based upon arbitrarily chosen geographical areas throughout and surround the State must be stored in the information retrieval system, and the system must be able to define and relate these areas to determine which overlap, which areas wholly contain other areas, and which areas are completely contained within other areas. The manner in which this is accomplished is through the Zone Reference File.

The Zone Reference File consists of a set of permanent files (probably 4 to 7) and an undetermined number of temporary files to be built up as the system is enlarged. Within the permanent files, a series of partitions are defined which vary from very gross sectioning of the pertinent geographical areas to quite fine partitionings of these same areas. For example, a possible set of permanent files designed to partition the State of Pennsylvania might be as follows:

Permanent File 1: Eight homogeneous regions recently defined by the State Highway Department

2: 67 Counties in the State of Pennsylvania

3: All minor civil sub-divisions throughout the State

4: All census tracts throughout the State

5: All block structures throughout the State

Any set of files can be incorporated into the system as dictated by the available and desired data. The only requirements the chosen partitions must meet are as follows:

1. Every successive partition is a refinement of the proceding one; and
2. The partitions chosen range in size from very gross sectioning to very fine partitioning of the given area. (i.e., at least as fine as required by the data to be incorporated into the system).

For each of the chosen partitions a permanent file is established. This file consists of an alphanumeric description of each section of the partition, a code number assigned to that section, and a reference code number. The reference code number is the number of the section in the next sequentially larger partitioning which completely contains the area being defined. (The first requirements insures that this reference code number always exists and is uniquely determined.) In this way, given any entry in one of these permanet files, the system can determine all sections in the other files which either contain this area or are completely contained within this area, making it possible to relate the areas and the corresponding data stored in the systems' element files.

Any time data is incorporated into the system which is not based upon one of the standard partitions, a temporary file is established. This file is used to define a new partition which is used infrequently enough not to warrant inclusion as a permanent file or which is designed to partition only a small area and not the entire State and surrounding communities. The first step in establishing a temporary file is to assign a number to each section of the partition to be defined. One of the permanent files is then chosen which represents a finer partitioning than the one under consideration, at least in the areas for which the new partition is defined. (The second requirements insures that this partitioning is always available.) It should be noted that convenience dictates that the permanent file chosen should be the largest partitioning which is still a refinement of the given partition, but this is not necessary. The temporary file then consists of a set of records, one for each of the entries in the permanent file. Each of the records consists of two code numbers: one of the numbers is the number of the section of the permanent file being used, and the second number is the number of the section in the given partition which completely contains the section defined by the permanent file being referenced. In this way, any given section of the new partition can be defined by noting, first, all the sections of the permanent file which together compose this section, and then, by referencing the definitions of these in the permanent file, they can be combined to form a definition of the given section of the new partition.

This can best be explained by an illustration:

Suppose a permanent file (call it File 50) consists of 10 areas as follows:

File 50

Code No.	Alphanumeric Descriptions	Reference Code No.
1	XXXXXXXXXXXXXXXX	3
2	XXXXXXXXXXXXXXXXXXXXXX	3
3	XXXXXXXXXXXXX	3
4	XXXXXXXXXXXXXXXXXX	2
5	XXXXXXXXX	2
6	XXXXXXXXXXXXXXXXXXXX	1
7	XXXXXXXXXXXXXXXX	1
8	XXXXXXX	4
9	XXXXXXXXXXX	4
10	XXXXXXXXXXXXXXXXXXXXXXXX	5

(refers to next larger section in permanent files)

Now, if a temporary file is to be established for 5 given areas, each of which is composed of areas in File 50, the temporary file (call it File 51) looks as follows:

File 51

Code No. (refers to entries in permanent file)	Reference Code No. (refers to section in the new partition)
1	2
2	3
3	1
4	4
5	5
6	5
7	3
8	1
9	(blank)
10	2

(note: the blank indicates that section 9 in the permanent file is not in the new areas being defined. Allowing for blanks allows one to define partitions of small areas not necessarily the entire state and surrounding communities)

Then if a data element in the system refers to File 51, Section 3, the system accesses File 51 to determine all permanent file sections contained within Section 3 of the temporary partition. These are, in the example above, Sections 2 and 7. Then File 50 is referenced and the descriptions of Sections 2 and 7 in File 50 are extracted and combined to form a description of the new section, which then can be used for display and printout purposes. Also, since all sections of the permanent files are defined in terms of their relationships to all other sections, the same capabilities exist for the temporary files through the reference to the permanent files.

APPENDIX H

EVALUATION OF PROJECTS AND PROGRAMS

INTRODUCTION

A resource allocation technique, described in Section 4, was used to facilitate evaluation of 93 projects and programs for PennDOT which were delineated from the universe of possibilities.

The technique was based on estimating the project investment cost to the State and the extent of benefits to be provided in each of nine categories. These estimates were manipulated using three goal ranking assumptions to allocate benefits in combination with two assumptions about the PennDOT budget for new projects (See Table 4-2 and Section 4-7). The results are shown in Table H-1. Those projects and programs chosen under each of the six combinations of assumptions are indicated by "√'s". Those projects and programs which received a √ under each of the six combinations of assumptions were assigned the highest priority in the Interim Master Plan as shown in Table 5-1.

Those projects and programs which did not receive any √ were assigned the lowest priority; also projects with two √'s or less were assigned the lowest priority, unless the need for the checked benefit was considered to be especially great. The remaining projects and programs were assigned to the second highest priority.

While this technique has merit for the initial efforts at shaping a Master Plan for Transportation, it clearly has the disadvantages associated with the arbitrary ranking of benefits and estimating of costs under conditions of less than adequate knowledge (see Section 4-3, Project Benefit Ranking). Nevertheless, it is still a refinement on using intuitive judgments to allocate resources when benefits are difficult to quantify in terms of dollar values. Hopefully, a PennDOT administration can establish a more sophisticated planning technique by 1975 using the Methodological Framework for Comprehensive Transportation Planning developed in Technical Advisory Committee Project 6b.

Table H-1

PRELIMINARY RESULTS OF PROJECT EVALUATION

Project No.	Project Description	Budget = $2 billion GOALS: Improvements in Transportation Service	Budget = $2 billion GOALS: Economic Development	Budget = $2 billion GOALS: Social Development	Budget = $4.9 billion GOALS: Improvements in Transportation Service	Budget = $4.9 billion GOALS: Economic Development	Budget = $4.9 billion GOALS: Social Development
R-1	Row - Pittsburgh to Harrisburg	✓	✓		✓	✓	
R-2	Row - Ohio to Pittsburgh	✓	✓		✓	✓	
R-3	Row - Harrisburg to Trenton	✓	✓		✓	✓	
R-4	90 mph Rails - Pittsburgh to Harrisburg	✓	✓		✓	✓	
R-5	90 & 150 mph Rails - Pittsburgh to Harrisburg	✓	✓		✓	✓	
R-6	90 mph Rails - Harrisburg to Philadelphia		✓			✓	
R-7	90 & 150 mph Rails - Harrisburg to Philadelphia	✓			✓	✓	
R-8	90 mph Rails - Ohio to Philadelphia	✓	✓		✓	✓	
R-9	150 mph Rails - Ohio to Harrisburg				✓		
R-10	150 mph Rails - Ohio to Trenton					✓	
R-11	Study Feasibility of Keystone Corridor	✓	✓		✓	✓	
R-12	Study Rail Equipment Reqts. Harrisburg-Philadelphia	✓	✓		✓	✓	
R-13	Study Harrisburg Terminal Requirements	✓	✓		✓	✓	
R-14	Renovate Harrisburg Terminal	✓	✓		✓	✓	
R-15	Build New Harrisburg Terminal Downtown	✓	✓		✓	✓	
R-16	Build Harrisburg Terminal at Olmsted	✓	✓		✓	✓	
R-17	Improve Selected Rail Stations	✓	✓		✓	✓	
R-18	Study Freight Terminal at Philadelphia	✓	✓		✓	✓	
R-19	Study Freight Terminal at Pittsburgh	✓	✓		✓	✓	
R-20	Study Freight Terminal at Harrisburg	✓	✓		✓	✓	
R-21	Study Freight Terminal at Wilkes-Barre - Scranton	✓	✓		✓	✓	
R-22	Study Freight Terminal at Erie	✓	✓		✓	✓	
R-23	Study Railroad Crossings	✓		✓	✓		✓
R-24	Straighten Track at Philadelphia	✓			✓		
U-1	Study Hovercraft on Rivers		✓	✓		✓	✓
U-2	Build Rail Connection (Penn-Reading Terminals)	✓		✓	✓		✓
U-3	Build Belt Conveyor (Penn-Reading Terminals)	✓			✓		
U-4	Demonstrate Electric Cars	✓	✓	✓	✓	✓	✓
U-5	Rail-Bus Demonstrations	✓			✓		
U-6	Study Aerial Tramway at Pittsburgh		✓	✓		✓	✓
U-7	Study Feasibility of Subsidizing Commuter Transportation.	✓	✓	✓	✓	✓	✓
U-8	Help Buy 275 Buses - Pittsburgh	✓	✓		✓	✓	

TABLE H-1 (Cont.)

Proj. No.	Project Description	2 billion			$4.9 billion		
		Trans.	Eco.	Social	Trans.	Eco.	Social
U-9	Help Buy 300 Buses - Philadelphia	✓	✓		✓	✓	
U-10	Help Buy Buses - Other Cities	✓	✓		✓	✓	
U-11	Help Buy 60 Rail Cars - Philadelphia Commuter Service	✓		✓	✓		✓
U-12	Study Urban Transit in Philadelphia	✓	✓	✓	✓	✓	✓
U-13	Study Jitney Service	✓	✓	✓	✓	✓	✓
U-14	Survey Row at Pittsburgh & Philadelphia	✓	✓		✓	✓	
U-15	Philadelphia Subway Extension	✓	✓		✓	✓	
U-16	Extend Hatboro Line - Philadelphia	✓	✓		✓	✓	
U-17	Purchase "Skycrane" Helicopter						
U-18	Study Controversial Freeways	✓	✓		✓	✓	
U-19	Study Liberty Tubes - Pittsburgh	✓			✓		
U-20	Study Skybus Demonstration Route - Pittsburgh	✓	✓		✓	✓	
U-21	Demonstrate Skybus on Selected Rout	✓	✓		✓	✓	
U-22	Construct 2000 Parking Spaces - Philadelphia						
U-23	Construct 2000 Parking Spaces - Pittsburgh						
U-24	Construct 4000 Parking Spaces - Other Cities						
U-25	Construct 50,000 Parking Spaces - Ends of Transit Lines	✓		✓	✓		✓
U-26	Sponsor Helicopter Rescue Service						
U-27	Study Exclusive Bus Lanes	✓			✓		
H-1	Complete 2nd - 6 year Highway Program		✓	✓	✓	✓	✓
H-2	Complete Major Highway Improvements	✓	✓	✓	✓	✓	✓
H-3	Study Release of Some Roads		✓			✓	
H-4	Improve 224 Accident Locations		✓			✓	
H-5	Improve 614 Hazardous Locations		✓			✓	
H-6	Improve 452 Hazardous Locations		✓			✓	
H-7	Study Need for Erie - Philadelphia Highway	✓	✓	✓	✓	✓	✓
H-8	Demonstrate Electronic Merge Signals	✓			✓		
H-9	Demonstrate Truck Weighing Devices						
I-1	Emergency Fund - Dept. of Commerce		✓	✓		✓	✓
I-2	Improve Port of Philadelphia		✓			✓	
I-3	Study Container Terminal at Chester	✓	✓		✓	✓	
I-4	Study Philadelphia - Baltimore Barge Service	✓	✓		✓	✓	

TABLE H-1 (Cont.)

Proj. No.	Project Description	2 billion			$4.9 billion		
		Trans.	Eco.	Social	Trans.	Eco.	Social
I-5	Improve Coal Loading - Philadelphia		✓			✓	
I-6	Study Pennsylvania Land-Bridge	✓	✓		✓	✓	
I-7	Construct Lake Erie - Ohio River Canal					✓	✓
I-8	Study Delaware River Channel Requirements		✓			✓	
I-9	Establish Foreign Trade Zones in Pennsylvania		✓			✓	
I-10	Survey Clearances	✓	✓		✓	✓	
A-1	Promote International Flights at Pittsburgh	✓	✓	✓	✓	✓	✓
A-2	Study Needs for Heliports and STOL Airports	✓	✓	✓	✓	✓	✓
A-3	Study Pittsburgh Airport Access	✓	✓		✓	✓	
A-4	Construct Rail Transportation to Phila. Airport	✓	✓		✓	✓	
A-5	Study Airport Terminal Requirements	✓		✓	✓		✓
A-6	Study General Aviation in Pennsylvania	✓	✓	✓	✓	✓	✓
A-7	Study Airspace Congestion - Philadelphia & Pittsburgh	✓			✓		
T-1	Construct Roads - Tocks Island	✓	✓	✓	✓	✓	✓
T-2	Construct Access Roads to Primitive Areas	✓	✓	✓	✓	✓	✓
T-3	Construct Scenic Parkways	✓	✓	✓	✓	✓	✓
W-1	Study Alternatives for Disposal of Dredgings	✓	✓		✓	✓	
W-2	Study Feasibility of Waste Pipelines		✓	✓		✓	✓
W-3	Study Garbage Back Hauling		✓	✓		✓	✓
L-1	Study Multi-Bottom Trailers		✓			✓	
L-2	Study Roles of PennDOT in Assisting PUC/ICC						
L-3	Change General Order 29	✓	✓	✓	✓	✓	✓
L-4	Study Hazardous Material Movement						
L-5	Study Electronic Law Enforcement Aids						
L-6	Study Reduction of Auto Pollution			✓			✓
L-7	Study Reduction of Vehicular Noise			✓			✓
L-8	Study Pledging of State Credit		✓	✓		✓	✓
G-1	Study "New City" Transportation	✓	✓	✓	✓	✓	✓
G-2	Establish Emergency Fund for State Planning Board		✓	✓		✓	✓

In the initial years of PennDOT planning, it is suggested that the allocation technique used here be employed in developing the priorities for projects and programs. The reliability of results, using the technique, can be greatly refined by systematically exploring costs and benefits associated with each proposed project and program. While such detail was not possible within the scope of developing an Interim Master Plan, four exemplary projects and programs were analyzed for feasibility to illustrate a check list of elements to consider. The four projects and programs analyzed are attached in Appendices H-1, H-2, H-3, and H-4. The respective projects and programs are:

- (I-7) Lake Erie - Ohio River Canal
- (L-3) Encourage Interline Arrangements Among Motor Carriers
- (U-17) Use of "Skycrane" Helicopter to Clear Disabled Cars from Roadways
- (R-1 to R-20) Keystone Corridor (including Harrisburg Terminal, Improvement of Selected Rail Stations and Intermodal Freight Forwarding Terminals at Philadelphia, Pittsburgh and Harrisburg)

The checklist used in evaluating feasibility is as follows:

Elements Influencing Project or Program Selection

- Control
- Flexibility
- Risk
- Timing
- Economic Viability
    - Delineating Costs
        - Investment
        - Operating Expenses
        - Social and Environmental Cost
    - Identifying Benefits
        - Revenue to State
        - Greater Capacity
        - Faster Speed
        - Cost Saving and Efficiency
        - Industrial, Occupational, Commercial Development
        - Tourism
        - Safety
        - Aesthetics
        - Comfort and Convenience
        - Access to Recreation Areas
        - Land Use
        - Social Improvement

It should be noted that the descriptive and quantitative material developed under "Economic Viability" can be used for guidance in providing input to the resource allocation models. The other elements, i.e., Control, Flexibility, Risk, and Timing, must be weighed in the minds of the planners in order to make final decisions on whether or not to proceed with implementation.

APPENDIX H-1

CONSTRUCTION OF LAKE ERIE-OHIO RIVER CANAL

PROJECT TITLE: CONSTRUCTION OF LAKE ERIE-OHIO RIVER CANAL

Description of Project

A proposed Lake Erie-Ohio River Canal following the route recommended in 1947 by the Army Engineers would provide a new navigable waterway extending about 120 miles from the junction of the Ohio River and Beaver River to the Lake Erie shore at the east end of Fairport Harbor. A series of dams and locks would provide water level control from an elevation of 682 feet at the Ohio River to Lake Erie at an elevation of 570 feet.

As proposed, the waterway would have a minimum channel depth of 18 feet and a bottom width of 300 feet, except in the Youngstown and Warren, Ohio, areas where restrictions along the river limit the width to 200 feet and 350 feet, respectively. Each dam would have dual 84x720 feet locks to accommodate tows.

Background of the Project

Interest in building an inland waterway to link the Great Lakes with the Ohio River-Mississippi Gulf waterways has appeared from time to time since the canal-building period of our country in the early 1800's. In fact, an all-Pennsylvania canal between the Ohio River and Port of Erie was constructed between 1831 and 1844. It was operated until 1871 when the collapse of an aqueduct, combined with the advent of rail competition, proved to be greater obstacles than the canal operating company could overcome.

During the past 90 years, the Army Corps of Engineers has made numerous studies of a Lake Erie-Ohio River Canal via at least five different routes. House Document No. 178 of the 76th United States Congress summed up study work done in February, 1939, and recommended a best route. As recently as October, 1964, hearings on the project were held at Pittsburgh, Pennsylvania, and Jefferson, Ohio, to review sentiment for and against the proposed Canal. A complete analysis of the proposed project was presented by the Corps of Engineers in 1965 ("Review of Reports on Lake Erie-Ohio River Canal," Colonel J.E. Hammer, Corps of Engineers, January 1965).

The most recent "re-evaluation" of the Canal idea was presented in June 1965, under contract to the Pennsylvania State Planning Board.

Our Recommendation

Do not undertake any planning or construction related to a Lake Erie-Ohio River Canal. However, do not oppose construction, should the Corps of Engineers or private companies decide to undertake the project as long as no State funds are required.

Rationale for Recommendation

The proposed Canal would likely benefit the Youngstown-Girard-Niles-Warren Area of Ohio more than it would any Pennsylvania Communities. There would be no significant improvement in flood control. Any recreation benefits which might occur from the Canal would be minimal. Yet, even with so few discernible benefits, the cost of construction would be very high, probably $1.5 billion.

For a more complete analysis of the pros and cons of the Canal, see "Re-evaluation of the Practicability of the Lake Erie-Ohio River Canal," State Planning Board, Commonwealth of Pennsylvania, June 1965.

APPENDIX H-2

ENCOURAGE INTERLINE ARRANGEMENTS AMONG MOTOR CARRIERS

PROJECT TITLE: ENCOURAGE INTERLINE ARRANGEMENTS AMONG MOTOR CARRIERS

Description of Project

Consider a change in General Order No. 29 of the Public Utilities Commission to allow intrastate motor common carriers of property to negotiate through-route arrangements. The existing provisions of General Order No. 29 are such that motor carriers are prohibited in intrastate movements from "tacking" assigned routes and jointly quoting the shipper a rate on movement from origin to destination. Currently, shippers must either search out a motor carrier who has been assigned a specific route which includes the desired origin-destination pairs or else deal individually with several truckers which have adjoining routes. The latter circumstances means that several bills of lading must be made out for one shipment. A suggested change in General Order No. 29 to allow interline arrangements among motor carriers already assigned routes by Pennsylvania PUC would mean that shippers would have more freedom of choice in choosing motor carrier service and, hopefully, get faster deliveries at the same cost.

Background of Project

The current Pennsylvania PUC General Order No. 29 has been the subject of much controversy. It has inspired protest by several motor carrier managements because the PUC General Order is in conflict with ICC regulations by motor carriers for interstate shipments. In fact, several bills have been brought before Congress which would *compel* motor common carriers to establish through-route arrangements similar to the requirements for railroads.

There has been some evidence that shippers, particularly those who ship in LTL quantities, have suffered as a result of the tight restrictions. Their intrastate shipments have reportedly been expecially troublesome between small towns for which only one small motor carrier has a certification.

The importance of interlining freight is proven by the fact that much freight hauled by truck in the United States is moved by more than one motor carrier between origin and destination. In 1966, the 1,217 motor carriers who reported statistics to ICC on intercity shipments showed about 1/3rd(by weight)of the freight carried was picked up or received from another carrier:

Description of movement	*Percent by weight*
Carried from origin to destination	65.6%
Carrier originated interline shipment	16.3
Carrier terminated interline shipment	15.9
Carrier was intermediate for interline shipment	2.2
	100%

Source: Adapted from *Trinc's Blue Book of the Trucking Industry*, Trinc Associates, Ltd, 1967.

Our Recommendation

Go before the Pennsylvania PUC and argue a case in favor of changing General Order No. 29 to allow motor carriers to make interline arrangements.

Rationale for Recommendation

There is evidence that General Order No. 29 is punitive not only to motor carriers but also to shippers. Professor Alexander Volatta of Penn State University, after an extensive investigation of trucking practices and regulations in Pennsylvania, found that "Pennsylvania carriers are very active in pursuing changes in their operating rights" (*Pennsylvania Transportation Regulation, A Comparison and Evaluation*, Alexander Volatta, Penn State University, August 1967). Furthermore, Professor Volatta concluded that "the large number of operating rights application suggests that carriers do not have sufficiently broad operating rights to provide desired service: This after some fifty-four years of entry control".

He points out that such tight restrictions could not only handicap particular carriers, but also influence shippers to forego Pennsylvania locations for possible assembly, and manufacturing for distribution activities. It must be remembered that neighboring New Jersey has no PUC regulations whatsoever regarding truck routes. This makes trucking a bit more chaotic than is true in Pennsylvania. Yet, there seems to be little protest from New Jersey shippers concerning lack of regulation.

Another element of interest is that motor carrier movements which cross state borders fall under Interstate Commerce Commission regulations and are not subject to PUC control. This situation has undoubtedly led to "cheating" on each side of the State. Motor carriers need only cross the Pennsylvania State border to a terminal and then come back again to classify as an interstate shipment. In an informal study made by the Southwestern Pennsylvania Regional Planning Commission in 1967, it was found that many truckers cross the border into Youngstown and Steubenville, Ohio, and then return to Pennsylvania to make the delivery. There may be good economic reasons for such behavior, but the suspicion is that such circuitous routing results from over-control by PUC (Our preliminary investigation of trucking activities in the Philadelphia Area showed similar border-crossing tactics). After interviewing 50 shippers and 20 representatives of motor carriers, the SWRPA has received indication that some shippers, particularly the small volume shippers, "have difficulties in getting pick ups and delivers." These were few complaints from large volume shippers, however. To some extent, this situation is due to the fact that operating efficiencies are poor when motor carriers attempt to give good service on small quantities. However, there is a strong possibility that the poor service is accentuated by the lack of operating freedom among the motor carriers of Pennsylvania to set up routine systems for handling long LTL shipments anywhere in the State.

The opponents to relinquishing more freedom of activity to the motor carriers cite reasons given in the 1930's for maintaining tight control: "We must regulate closely to protect the public and provide adequate service". However, over control actually restricts service and leads to inefficiencies. Both motor carriers and shippers suffer. It should be noted that even though movements of agricultural products are unregulated (because of farmer protests in the 1930's), the truckers engaged in transporting agricultural products have not altogether perished with their perishibles. A recent study showed the surprising stability or residency of agricultural truckers by determining the number of years in business (Mildred R. D. Wolfe, *For Hire Motor Carriers Handling Exempt Agricultural Commodities,* Native and Extent of Operations, Washington, D.C., USDA, Market Research Report No. 585, p.5). The extensive survey showed that 60% of the exempt carriers had been in business 10 years or longer and that 8% had been in business 30 years or longer. The survival rate indicated by these figures shows, although obliquely, that competition in trucking need not necessarily lead to instability and result in poor service to shippers. In fact, tight control on truck routes can lead to serious competition to common carriers from another source, the private carrier. Individual shippers are apt to deliver in their own trucks rather than suffer poor service brought about by lack of competition. There is already a trend toward shipper-owned trucking in the United States. One authoritative source estimates that 12 out of 13 trucks on the road are shipper-owned and account for about 2/3 of intercity truck traffic (James R. MacDonald, "Captive Carriers," *The Wall Street Journal,* November 11, 1964). By owning his own truck, the shipper can run his production line right out to the street. This can cut delivery time considerably for short hauls. However, the small shipper must still depend on common carriage, and it is in his interest, if no other, to provide adequate service. The extent to which the small shipper relies on common carriage is indicated by the estimate that 75% of the revenues of most big motor carriers in the United States come from LTL freight ("Trucking Rolls into the Age of the Giants," *Business Week,* June 12, 1965). Of all the revenues received by motor carriers operating Middle Atlantic intercity truck routes in 1966, 60% was derived from LTL freight (adapted from *Trinc's Blue Book of the Trucking Industry,* Trinc Associated, Ltd, Washington, D.C., 1967). It is particularly important to provide good LTL service because many of the fast growing industries which pay high wages rely on trucks for their material input and product distribution.

The influence of good trucking service on plant location was examined by the American Trucking Association in 1962-63. Their survey of 1,332 shippers in the United States included several from the State of Pennsylvania (*Highways, Trucks, and New Industry*, American Trucking Association, 1963). A spontaneous gripe from a Pennsylvania manufacturer of the ATA report was: "Our main plant is located in an area that can be serviced by only a few carriers. Therefore, all freight must originate on these carriers and be transferred to others after a short trip. Since our commodity is not cartoned or protected, this is a distinct disadvantage. That company elected to build a branch plant in a town which 'had many common carrier truck lines with terminals and rights to major marketing areas in the East,' rather than expanded the main plant."

One of the assumed goals of the State is to attract industry fleeing from the high-cost areas of the East. The Central Pennsylvania Area, where unemployment rates are high, needs that new industry the most. The existing provisions of General Order No. 29 have the effect of pushing new industry to either side of the State where more liberal ICC regulations can prevail, if not out of Pennsylvania to a state where PUC route regulations are more tolerant or non-existent.

APPENDIX H-3

USE OF "SKYCRANE" HELICOPTER TO CLEAR DISABLED CARS FROM ROADWAYS

PROJECT TITLE: USE OF "SKYCRANE" HELICOPTER TO CLEAR DISABLED CARS FROM ROADWAYS

Description of Project

Use a Sikorsky S-64Y Skycrane to lift disabled cars from crowded roadways. This would allow traffic to move quickly past the scene of misfortune and permit rapid access by a tow truck. The disabled car would be towed away in a conventional manner while the Skycrane would return to its base of operation or to another project.

The Sikorsky S-64Y Skycrane is a heavy lift crane helicopter. It has two engines and two rotors. The principal rotor is 72 feet in diameter and has six blades. Its maximum speed is 126 mph. Cruising speed is 109 mph. The range is 253 miles. Rate of climb is 1700 fpm (Commercial Rotary Wing and STOL Aircraft, Helicopter Association of America, 1967).

Background of Project:

The Skycrane has been highly touted as the answer to the nagging problem of how to clear away temporary traffic blocks such as disabled cars. City officials at Chicago are currently considering the purchase of such a helicopter for use by its Fire Department in fire fighting and for lifting cars off roadways. There is little doubt that the Skycrane has the lift capacity to perform such functions. It is being used now in South East Asia for unloading 10-ton containers from cargo ships ("Impact of Containerization on Ocean Transportation: Dimensions of the Problem", G. E. Germane, paper, Transportation Research Forum, Montreal, Quebec, 1967).

The auto lift-off system has been tried on a demonstration basis at least twice during the past several years, once in Detroit and once on Long Island.

Our Recommendation

Do not undertake the initiation of emergency auto lift-off service using the Skycrane. Its cost, operating expenses, and lack of quick-lock on ability make it impractical for the suggested use on roadways. The State could spend $5 million, the cost of the Skycrane, on other transportation projects. However, do stay alert to any new developments in helicopter lift-off or other systems which could be used to accomplish the same objective during rush hours. For example, an elevated log-lifter type of vehicle, like that used in the logging industry has been used for clearing disabled cars from the Oakland Bay Bridge in California for a number of years. Such a car-stradling vehicle, geared for higher speed, might be appropriate for emergency use on the expressways of Pennsylvania's cities.

Rationale for Recommendation

The cost of equipment and operation is too high for the infrequent use which a Skycrane helicopter would likely have. Furthermore, there is still no suitable technique for attaching to the disabled car without going through a complex, and perhaps dangerous, process of putting men on the ground to make the attachment. The attachment and removal requires about 15 to 20 minutes worth of effort. The operation can only be carried out when there are no overhead obstructions at the scene of misfortune, and in reasonably good weather. This considerably limits the utility of the Skycrane, particularly in and near cities where they would be needed most during snow storms.

Analysis

Control

The Skycrane would presumably be at least partially State-financed and operated by some government agency, such as the State Police. Other potential operators would be City Police, City Fire Department, or private helicopter operators on contract to a government agency.

Flexibility

The Skycrane might be used for assistance on construction projects, as well as for car removal. Helicopters have been used for such jobs as placing steeples on churches, and, occasionally, it might be used for unusual emergencies, such as lifting a sinking boat out of the water. However, its utility for non-roadway emergencies is probably very limited. Conventional helicopters could be used for most emergency rescue work.

Economic Risk

If the project should not be successful, it could be difficult to sell a high-cost, high-maintenance helicopter. The only potential buyers might be the U.S. military or a foreign government.

The great risk would be low utilization at very high overhead expense. Some idea of the possible results of low utilization can be learned from newspaper articles which appeared in the Philadelphia Inquirer on January 28, 1968. The article dealt with low utilization of a helicopter which is being dedicated to emergency rescue service on an experimental basis:

> "State and Federal taxpayers are shelling out $15,500 a month to keep a helicopter ambulance on duty in the Philadelphia area, but the copter hasn't been used once in the two and a half months it has been available" ("Funds spent on Idel Copter Ambulance", Philadelphia Inquirer, January 28, 1968).

As a footnote, an article appeared in the February 8, 1968, issue of the Philadelphia Inquirer, which told of a helicopter rescue of a man from the scene of an automobile accident ("Copter Takes Driver from Car to Hospital", Philadelphia Inquirer, February 8, 1968).

Timing

Even if the clearance of disabled cars by Skycrane looked more favorable, it would probably be wise to wait for private or federal support of a demonstration project before commiting State funds. This would reduce the risk, inherent in being first.

Economic Viability

Identifying Benefits

The chief benefit to be gained by use of the Skycrane is that of increasing speed in transit on those relatively rare occasions when a traffic-snarling accident occurs.

Revenue to the State

The State might charge a fee to the motorist for removing disabled cars. However, the fee for such service could well be more than the value of the car to meet costs in many cases. It is not likely that most motorists could easily pay the fee. Furthermore, insurance companies would not be eager to pay for such lifting and towing.

Other Benefits

The benefits would chiefly be those associated with maintaining free flow of traffic during rush hour, *i.e.*, speed and capacity. Occasionally, traffic accidents during peak hours on expressways near Pittsburgh, Philadelphia, Erie, Harrisburg, and Scranton halt traffic for an hour or more. However, only a very few occurred in such a way to severely restrict access by tow truck to clear the street.

If other uses of the Skycrane could be found, they could have great significance in justifying its purchase. The optimum would be to rent the services of the Skycrane on an emergency basis from private companies which may have regular use for it. There has been much discussion about using the Skycrane as an aid to construction work or in loading and unloading cargo at ports. However, its high cost of operation seems to limit its use for such activities chiefly to military situations.

Delineating Costs

Investment

Should a Skycrane helicopter be purchased, the price would be about $5 million. If an enclosure were built to house the Skycrane, the investment cost would, of course, be even higher.

Operating Expenses

The daily maintenance cost would be about $1000, assuming two hours use per day. The salary of a full-time pilot and operating personnel would be an add-on of at least $150 per day. Any maintenance of landing pad and ground facilities should also be considered.

Other Costs

The prop wash of a Skycrane hovering near the ground can stir up gravel which could injure anyone working underneath.

A swinging car being lifted from the pavement might fall and do damage to property and people underneath.

The novelty of the Skycrane can cause distracted motorists to have accidents. Reportedly, several minor accidents occurred as a result of auto drivers "rubbernecking" when the Skycrane was being demonstrated at Detroit ("Test Uses Copter to Remove Cars," New York Times, January 29, 1967).

Comparing Costs and Benefits

If we assume that two roadway jams could be eliminated from crowded roads per day at a variable cost of $1200, then the cost per clearance would be $600. This figure is exclusive of conventional towing charges, which would also be required, and depreciation on the helicopter. Depreciation of $5 million over 10 years, the expected life of the Skycrane, would be about $1350/day. Thus, the total cost allocated to clearing a traffic jam under the assumptions made above would be in excess of $1200. In practice, however, the Skycrane would likely be used only a few times per month (as are emergency rescue helicopters in cities which they serve). If the Skycrane were used only twice per month, the variable maintenance charge would still be $1000 for the two occasions of use, but salaries of crew and depreciation would run the cost per clearance up to about $23,000. Even if we valued motorists time at $4 per car per hour per car and assumed the elimination of a one-hour stopage, about 6000 cars which would have otherwise been blocked, would be the minimum to justify the expense.

The 6000 cars stretched through two lanes would cover a distance of about 12 miles. It seems unlikely that such jams occur with even a regularity of twice per month in the largest of Pennsylvania's cities.

APPENDIX H-4

THE KEYSTONE CORRIDOR

PROJECT TITLE: THE KEYSTONE CORRIDOR

Description of Project

The Keystone Corridor would be a high-speed transportation link across Pennsylvania. It would pass near Pittsburgh, Harrisburg, and Philadelphia over a distance of about 340 miles from the Ohio border to New Jersey (Demand, Supply, and Economic Impact of Transport in the Keystone Corridor, Westinghouse Air Brake Company, February 1967). The proposed construction on the corridor would be designed initially to accomodate all possible types of high-speed surface systems. This would require tunneling through mountains, building bridges, and making cuts and fills across the State to build a roadbed surface which would have a minimum curve radius of 10,000 feet and a maximum grade of 0.5% with a surface width of 81 feet. The first use of the roadbed would be for tracked vehicles, i.e., high-speed trains. The proposal calls for laying two tracks on the roadbed which would support 90 mph trains. Later, another two tracks would be laid for 150 mph trains.

The Corridor's primary use would be for moving high-value freight. However, there should also be possibilities for transporting passengers to some tie-in with the Northeast Corridor rail network. Thus, Pittsburgh passengers could move rapidly on trains to Philadelphia, Washington, D.C., New York, or Boston. Also, autos and passengers might be quickly ferried across Pennsylvania to various destinations in Megalopolis, where they could roll off the rail cars and on to city streets.

Background of Project

The idea of a Keystone Corridor was originally conceived by several people at Carnegie-Mellon University (formerly Carnegie Institute of Technology) in the mid 1960's. The Corridor was envisioned as a means of meeting a

goal which was later outlined in a report of the Governor's Council of Science and Technology (Science and Technology, Generators of Economic Well-Being, Governor's Council of Science and Technology, September 1964). The goal was "to provide appropriate intercity transportation in Pennsylvania and to promote the growth of a technologically pioneering industry within the Commonwealth". (Report on the Keystone Corridor Transportation Study, Transportation Task Group, Carnegie Institute of Technology, July 1965). By the time the Governor's Committee for Transportation was formed in 1967, the idea of a Keystone Corridor had received considerable attention in the State, not only by the governing body, but also by the press. The May 1, 1967 issue of Railway Age featured the Corridor on its cover and carried a lead article based on Governor Shafer's comments about the Corridor at the Second International Conference on Urban Transportation.

The most authoritative work done to date, in evaluating the Keystone Corridor, was a study conducted by the Westinghouse Airbrake Company (op cit.). The WABCO report, completed in February 1967, concluded that the Corridor had strong potential for worthwhile investment by the State. Therefore, they recommended that a trans-Pennsylvania strip of land for a Keystone Corridor be purchased as soon as possible and that the strip of land be held until such time as funds could be made available for construction of it. However, because of the lack of available data on freight and passenger movements across the State the results of this study are not sufficiently complete to assess whether a Keystone Corridor should be built.

The Governor's Committee for Transportation recommended at their meeting on August 28, 1967, that further study is needed of the Keystone Corridor concept and that the acquisition of rights-of-way should be predicated on the results of such study.

Our Recommendation

A more detailed feasibility study should be made of demand, economic viability, preferred route and configuration for a Keystone Corridor as follow-up on the WABCO study. The principal criterion for determining the best route includes the minimizing of total cost for acquiring right-of-way and preparing a suitable roadbed to meet the requirements for high-speed transportation across the State. If the results of the feasibility study indicate that a Keystone Corridor is economically viable, we recommend that PennDOT buy the right-of-way between the Ohio border and Harrisburg. Additionally, we recommend that a planning study be made of the advisability of buying right-of-way between Harrisburg and Trenton, New Jersey. Concurrently, studies should be made to determine the needs for Intermodal Freight Forwarding Terminals at Pittsburgh and Philadelphia. If the preliminary studies indicate that needs and opportunities are sufficiently great, follow-on studies should be conducted to determine specifically where and when Intermodal Freight Forwarding Terminals should be constructed. Logic dictates that improvements in freight handling and processing (where the greatest bottlenecks are now) precede the development of a high-speed ground transportation network.

Early support should be given to providing improved rail service for passengers between Harrisburg and Philadelphia. Construction of a combination rail, air, and bus station at Olmsted State Airport is favored. But other factors such as the convenience of the existing terminal to government office buildings at Harrisburg suggest that at least a preliminary study is needed in order to determine whether to refurbish or rebuild a downtown station at Harrisburg as an alternative to building the rail station at Olmsted Airport. At any rate, PennDOT supported improvements on the rails between Harrisburg and Philadelphia should be delayed until the study of a Harrisburg to Trenton "linear city" alternative is completed. The concept of building a "linear city" is one in which small communities are built at railroad stops, somewhat in the same fashion that the "Main Line" communities in Philadelphia evolved. Conceptually, the same right-of-way could be used for conventional rails to serve the local communities between Harrisburg and Trenton, while simultaneously providing the right-of-way for a high-speed system on a Keystone Corridor.

Rationale for Recommendation

Some may question the wisdom of a recommendation to purchase right-of-way with no immediate plans for building on it. However, if sufficient matching funds eventually are made available for construction on the right-of-way and if the trend continues toward increasing TOFC and COFC movements, perhaps then the construction project would look more favorable to a PennDOT administration. Operating benefits to the State will likely outweigh operating costs in the 1980's to the extent that a 90-10 matching program by some organization like the U.S.DOT would constitute sufficient incentive for a PennDOT to participate in construction.* Additionally, the flexibility of the project seems great enough to accomodate all foreseeable (and perhaps unforseeable) technological breakthroughs in the field of transportation. The economic risk of buying right-of-ways is not great, because there is little doubt that right-of-ways between neighboring population centers will be extremely valuable by the year 2000, only 32 years hence. More people will need greater mobility while maintaining residence at or near existing urban population clusters, even with expected improvements in communications. There will be only limited air space over population centers for movement of people. Ground-supported transportation facilities will be the answer to the problem of moving large numbers of people between population centers such as Pittsburgh and Philadelphia. Neither the winding route of the Pennsylvania Railroad nor the circuitous route of the Pennsylvania Turnpike would suffice for high-speed transport. Interstate 80 is too far north to benefit the major city pairs in the State. Meanwhile, much of the available land over which the Corridor would run is being occupied, divided, and developed. Furthermore, each year the cost of acquiring the right-of-way is increasing. Some may argue that the land costs are not increasing at the rate of 5 percent per year, the approximate interest rate on the last Pennsylvania General Obligation Bond. It is difficult to take an authoritative stand on the issue of future land values without making a more detailed analysis of trends in land prices on the Corridor. Nevertheless, the opportunities presented by right-of-way ownership compared with the opportunity losses associated with not owning right-of-way appear so great that they cannot be ignored. The mere ownership of the right-of-way could have great economic significance to the State, because the possession of the right-of-way could be the decisive factor in eventually persuading the U.S. DOT to help finance construction of the Corridor. The U.S. DOT might justify the expenditure on the basis of increasing the competitive structure of midwest manufacturing industries and thus promoting more employment in the midwest. Pittsburgh should especially benefit by becoming a transportation hub on completion of the Corridor, while both Harrisburg and Philadelphia would prosper as distribution centers. All three cities should become more attractive from the standpoint of plant location, especially if the Corridor were supported with outstanding freight yards and distribution terminals at each of the three cities. This type of development would correspond with several of the State goals:

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*The Federal Government is financing only a small share of the Northeast Corridor cost. Most of the cost is being met by private industry.

1. Helping each mode find its comparative advantage.
2. Improve the speed of transport for freight and passengers.
3. Provide more employment in Pennsylvania.

4. Capitalize fully on Pennsylvania's proximity to the world's richest markets.

5. Make Pennsylvania the "Transportation Research and Development state"; attract a National Transportation Institute to be funded by the Federal Government.

With regard to the last State goal, it would be advantageous to begin the Corridor project with a test facility location which could be incorporated into the route of the Keystone Corridor. That is, a length of track used for high-speed rail research in western Pennsylvania might be the first leg of the Corridor.

Analysis

Control

If the Keystone Corridor system is constructed, the PennDOT's role should be one of financing only. Thus the PennDOT would become involved in actual operation of the Corridor facilities only if it appeared as if the appointed management were having difficulties in meeting financial obligations. Actual daily operating control of the Corridor facilities might best go to a private transportation company or, in the absence of private interest, to a commission like the Pennsylvania Turnpike Commission.

Flexibility

One of the most favorable aspects of a Keystone Corridor as it has been conceived, is the flexibility with which it could be used. The design would allow for adding improved rails after the first two were layed or for paving over the rails should the roadbed be used to accomodate technological developments such as hovercraft or electronically guided vehicles.

If the right-of-way is purchased across the State, it seems highly probable that, as a minimum, segments of the strip of land would have some utility before the year 2000. For example, if the right-of-way were now owned in western Pennsylvania, there would be a better chance of attracting a much-desired federally supported transportation research facility to that part of the State. It is rumored that the U.S. DOT will establish a test station somewhere in the United States where thay can try new transportation-related concepts such as linear-induction propulsion. The availability of land, and especially linear right-of-way, could be instrumental in their decision making regarding location of the site. Also, any new surface improvements on a segment of the Corridor could be the start of a complete length of vehicle-supporting surface across the State. In addition, there is little doubt that a right-of-way between the vicinity of Harrisburg and some part of Bucks County would have some utility before the year 2000, if for no other reason than influencing population growth toward Harrisburg. Bucks County is expected to grow in population to over 600,000 by 1985 (1985 Regional Projections for the Delaware Valley, Delaware Valley Regional Planning Commission, 1967). The 1960 population was only about 300,000. The PennDOT's possession of right-of-way would be welcomed by planners who could then build their programs around eventual use of the right-of-way. One use might be the building of a linear city between the Northeast Corridor and Harrisburg to accomodate some of the population overflow. Such a system is now being developed near Stockholm in Sweden ("Suburbs Like a String of Pearls" -- Stockholm's Progress Linked to T-Bana", The Philadelphia Evening Bulletin, 1967). The technique being used in Sweden is one of laying tracks and building suburbs concurrently.

The rail stations are each town centers for clusters of about 10,000 people. High rise flats are being constructed within 500 yards of the station; detached homes are within 1000 yards --- all within walking distance along pathways. Another alternative would be developments of new towns on the existing right-of-way of the Penn Central Railroad between Paoli and Harrisburg. This would be the equivalent of extending Philadelphia's "Main Line" beyond Paoli.

Economic Risk

There are actually two risks to be considered. One is the risk associated with buying right-of-way. The other is the risk of building a costly trans-state structure which would have high maintenance requirements and low utilization. The first risk appears to be much lower than the second. Buying the right-of-way supposedly would cost about $23 million (WABCO op. cit. for land purchases between Pittsburgh and Harrisburg plus about $100 million for land between Harrisburg and Trenton, New Jersey (FIRL estimate). The flexibility of use and the apparent forth-coming demand for the right-of-way makes it appear to be a good investment. The second risk, that of construction on the right-of-way, is much more sensitive. Any construction on the entire length of the right-of-way will be costly, an estimated $1.5 billion (WABCO op. cit.). It will be particularly important to conduct a detailed study of the demand for high-speed transportation across the State before making a final commitment. Such a study should include interviews with shippers and transportation companies.

Timing

It would be preferable to acquire the right-of-way as soon as possible. Mere possession of the right-of-way might inspire substantial investment in development by private companies and federal government agencies which otherwise would not come about. Possession of the right-of-way would also enable planners to work with something concrete.

The actual construction on the right-of-way would be delayed until the appropriate combination of financing, technology, and proven demand for high-speed trans-state transportation evolve. For example, the cost of tunneling, currently estimated at about $10 million/mile, might be reduced drastically as a result of new boring and chemical treatment techniques being developed at MIT and other schools.

Currently, there is great difficulty in obtaining funds for any kind of transportation improvement. The difficulty is related to the great public expense of carrying on military activities in South East Asia. The great government commitment of funds to the war effort has helped set off a round of inflation which has been translated into high interest rates and cutbacks in federal government spending in the U.S. In fact, the federal funding of the Interstate Highway Program has been cut back as a deflationary measure, although funds are definitely being held for completion of the projects once the threat of rampant inflation is reduced. A combination of cessation of military activity in South East Asia and an economic recession would likely inspire great federal financing of transportation projects. This would be the optimum time to press for matching funds for a gigantic undertaking like construction of the Corridor roadbed and trackage. The important consideration would be the ownership of the land and completion of the demand studies so that massive federal financing could start quickly when it would be utilized as a tool to pump up the economy of Pennsylvania and its neighboring states.

Economic Viability

If the Corridor system were constructed, revenue to the State would result in the form of greater taxes from improved land values and higher payrolls. Additionally, there would be direct payments made by an operating authority or organization which would charge customers for use of the Corridor. However, if the land for the Corridor is purchased and held for a number of years, then in all probability, there will be no direct revenues from the investment. In fact, some property would be removed from the tax roles and land values would be decreased as a result of dividing properties such as farms and residential lots.

In order to judge the extent of additional tax revenues which would accrue to the State from construction on the Corridor, it would be necessary to first estimate employment increases in Pennsylvania and extend of land-value appreciation. The complexities of such an estimate are so great that they are beyond the scope of an Interim Master Plan. However, they should be considered temporarily as non-quantifiable benefits (or handicaps).

The potential direct revenues from operation of a Keystone Corridor system have great significance in determining the advisability of undertaking the project. It was decided to estimate the revenues on a per car basis, assuming the State would receive "X" dollars per rail car which traversed the track regardless of the value of its contents. This pricing technique is perhaps more reasonable than the existing rate system based on the value of commodity. The "per car" rate is probably not as valid as using a car-weight rate if it is desired to charge on a cost basis, because the weight of the car is an important factor in regard to rail damage and roadbed damage.

Nevertheless, the "per car" basis charge is a possible method of charge which can screen out those movements which cannot be economically justified on the Keystone Corridor tracks, i.e., the incremental maintenance cost and extra fuel cost attributable to the fast movement is greater than the value of time saved in moving the low value freight.

The range of potential direct revenues can be roughly estimated under three sets of assumptions:

The first set of assumptions is for maximum movement on the Keystone Corridor, e.g., all road and rail freight shipments traversing the state would be carried on the Keystone Corridor.

a. The Corridor would carry all rail traffic now moving on the Main Line of the Penn Central Railroad between Pittsburgh and Philadelphia.

b. The Corridor would carry all materials which would otherwise traverse the State on the Pennsylvania Turnpike via truck.

c. Rail passenger traffic across the State would be 50 times the 1966 traffic with 65% occupancy of coaches.

d. All other traffic in the State would be unaffected by the construction of a Keystone Corridor.

A second set of assumptions to be considered is as follows:

a. 90% of the TOFC and COFC movements across Pennsylvania would go via the Corridor if it were constructed.

b. 20% of the existing boxcar movements would go across the State via the Corridor.

c. 20% of the truck movements across Pennsylvania would go via the Corridor if it were constructed.

d. Rail passenger traffic across the State would be 10 times the 1966 traffic with 65% occupancy of coaches.

e. All other movements in Pennsylvania would be unaffected by construction of the Corridor.

The third set of assumptions to be considered is as follows:

a. 50% of the TOFC and COFC movements across Pennsylvania would go via the Corridor if it were constructed.

b. 5% of the boxcar movements across the state would go via the Corridor.

c. 5% of the existing truck movements across Pennsylvania would go via the Corridor if it were constructed.

d. Rail passenter traffic across the State would be twice the 1966 traffic with 65% occupancy of coaches.

e. All other movements in the State would not be affected by the availability of the Corridor.

The first set of assumptions represents the maximum utilization of the Corridor under conditions of existing demand for trans-Pennsylvania freight movements. It is highly improbable that such utilization can be approached. For example, there would be independent truckers who would find it economically advantageous to bring their loads across the State on their own rubber, rather than use rail transportation. Difficulties in transport to and from the rail terminal on each side of the Corridor would make it easier for some truckers to travel the Pennsylvania Turnpike or Interstate 80 in route to destination than to use the Keystone Corridor rail facilities.

The assumption that all trans-state rail traffic would go on the Keystone Corridor is very unlikely for several reasons. First the Penn-Central Railroad must maintain rails to serve intermediate points in the State It would be impractical to build rails tie-ins with the Corridor for less than trans-state shipments. Second, low value freight would not justify a switch from the Main Line to the Corridor at a premium charge.

The second set of assumptions most likely represents a practical upper limit of use of a Keystone Corridor by 1975. It is still ambitious to hope that the Corridor could pull 20% of the trans-Pennsylvania truck movement from the Turnpike. This is especially true in view of the fact that many truckers now using the Turnpike may find advantages over both the Turnpike route and a Keystone Corridor by traveling over Interstate 80 starting in 1971.

The third set of assumptions represents a reasonable lower limit which could be expected as a market share of all trans-Pennsylvania shipments by ground transportation if the Corridor were supported by suitable terminals. A preliminary examination of Penn Central's records on rail car movements indicate that it is reasonable to assume that at least 5% of enclosed non-bulk rail movements on the Main Line across the State are of high enough value to justify paying some premium for a fast trip on the Corridor. This conclusion assumes that rapid switching and transfer facilities would be provided at each end.

The percentage of trans-Pennsylvania rail movement which now goes by TOFC or COFC is some indication of value of produce because only higher valued products could justify the higher rate required for such shipments. An analysis of rail shipments across Pennsylvania on the Main Line of the Penn Central Railroad showed that approximately 20% of the shipments in November 1967 were by TOFC or COFC and about 60% were by boxcar. Thus, about 25% of all enclosed non-bulk rail car movements were by TOFC or COFC.

The volume of commercial traffic on the Pennsylvania Turnpike in each of the years 1966 and 1967, was only slightly higher than that in 1957 and 1959. (Volume of Traffic on the Pennsylvania Turnpike, 1942-1966, Pennsylvania Turnpike Authority.) More likely, however, the construction of better roads, particularly Interstate 80 to the north has taken some truck traffic from the Turnpike. Nevertheless, it does not seem overly ambitious to assume that 5% of the volume of the trans-Pennsylvania truck traffic on the Turnpike could be converted to TOFC and COFC, as was suggested in the third set of assumptions.

The next task was to estimate existing trans-Pennsylvania freight movements so that they could be used as bases for conversion to probable movements on the rails of a Keystone Corridor. Existing transportation conditions were used as bases for estimates. This technique results in conservative estimates but lends more credibility to any positive conclusions which might be made. There is little doubt that trans-Pennsylvania freight traffic (considering air, rail and road movement together) will be substantially greater in the mid 1970's than they are now (See Demand Analysis, FIRL, 1968).

The volumes of traffic generated from the above assumptions related to present conditions is as follows:

FIRST SET OF ASSUMPTIONS

(All East-West, Trans-Pennsylvania Freight now carried by Rail or Truck would move on the Keystone Corridor if it were available)

Expected Annual Volume on Keystone Corridor

Classification of Traffic	Number of loaded rail cars[2] (one way) (ooo's)	Number of trucks[3] (two ways) (ooo's)	Number of equivalent rail cars[4] (two ways) (ooo's)
TOFCs, COFCs	62.8		125.6
	228.0		456.0
Boxcars	66.0		132.0
New auto carriers, bulk rail cars, etc. not classified above			485.0
High speed passenger cars		1640.0	820.0
Trucks[1]			
Total	365.8	1640.0	2018.6

[1] Two truck or container shipments is the equivalent of one rail car movement. The 90-ft flat cars now being made for TOFC/COFC shipments are each capable of carrying two piggyback trailers or tub containers.

[2] See Table D-4; refers to the number of loaded cars moving east or west which ever number is higher.

[3] Assumes 4,500 trucks daily traverse the Commonwealth; Adapted from Demand Analysis, Appendix Volume, FIRL, 1968, pp A-3, A-4.

[4] Assumes balance by returning empty cars, via the Keystone Corridor.

SECOND SET OF ASSUMPTIONS

(90% TOFC and COFC; 20% of Boxcar; 5% of Other railcars, 20% of Trucks now transversing Pennsylvania would do so by Keystone Corridor if it were available.)

Expected Annual Volume on
Keystone Corridor

Classification of Traffic	Number of equivalent railcars (two ways) (000's)
TOFCs, COFCs	113.0
Boxcars	91.3
New auto carriers, bulk rail cars, etc. not classified above	6.6
High-speed passenger cars	97.0
Trucks	164.0
Total	471.9

THIRD SET OF ASSUMPTIONS

(50% TOFC and COFC; 5% of Boxcar, 5% of trucks now traversing the state would do so by Keystone Corridor if it were available.)

Expected Annual Volum on
Keystone Corridor

Classification of Traffic	Number of equivalent railcars (two ways) (000's)
TOFCs, COFCs	62.8
Boxcars	27.8
New auto carriers, bulk rail cars, etc. not classified above	0.0
High-speed passenger cars	19.4
Trucks	41.0
Total	151.0

There were two principal sources of available data for analysis which were used in generating numbers for the tables. One set consisted of several magnetic tapes prepared by the Penn Central Railroad. The tapes contained information by origin, destination, commodity carried, weight of shipment, and switch point (when the car entered or left the Pennsylvania Railroad system) for each loaded rail car moved on the tracks of the Pennsylvania Railroad during November of 1967. There were also a few records of car movements for the months of October and December, but they appeared to be less than 5% of the total. The Pennsylvania Railroad data was sorted by origin and destination of rail car. In order to break-out those cars which traversed the State, programs were arranged to yield print-outs of cars which traversed the State on the Main Line of the Penn Central Railroad. (See Table D-4 for results).

The other set of data used in the analysis was that developed by The Franklin Institute Laboratories for vehicular movements on the Pennsylvania Turnpike during 1966. (Demand Analysis, FIRL, 1968). Our objective was to use the data to estimate total freight movements which go between Pittsburgh and Philadelphia or beyond by ground transportation.

The estimates of rail car movements which resulted from manipulation of the data under the three assumptions outlined were 2,019,000, 472,000 and 151,000, respectively. Based on these results, it seems reasonable to assume that the potential market for the Keystone Corridor is about 200,000 to 500,000 rail car movements per year, depending on the rate charged.

Delineating Costs

Perhaps a good indication of the probable investment cost and operating cost for a Keystone Corridor could be gained from actual experience with the Japanese Tokaido Line. There are many parallels between the Tokaido Line, built by Japan National Railways, and the proposed Keystone Corridor. The Tokaido Line traverses some very rugged terrain between two of Japan's major population centers, Tokyo and Osaka The track-distance between the centers is 320 miles. The proposed Keystone Corridor would run from the Ohio border to the New Jersey border, a distance of about 300 miles. A comparison of the two is shown in Table H-2.

Table H-2

COMPARISON BETWEEN THE JAPANESE TOKAIDO LINE AND THE PROPOSED RAIL LINE ACROSS A KEYSTONE CORRIDOR

Description	Tokaido Line (Japan National Railways)	Proposed Keystone Corridor* (As conceived by Westinghouse Airbrake Company)
Primary Service	Passenger	Freight
Terminal Points	Tokyo-Osaka	Ohio Border (Pittsburgh Area)- New Jersey Border (Phila. Area
Trains per Day	60 each way	
Cars per Train	12	
Rail Distance	320 miles	290-340 miles
Power	Electric	Several power sources
Maximum Safe Speed	155 mph	100 mph+, 150 mph+
Maximum Cruising Speed	130 mph	90 mph; 150 mph
Time in Transit (with 2 stops)	3 hours, 10 minutes	about 4 hours (no stops medium-speed tracks)
Time in Transit (with 10 stops)	3 hours, 40 minutes	
Number of Tracks	2	4
Grade Crossings	None	None
Minimum Curvature Radius	8200 feet	10,000 feet
Maximum Grade	1.5 percent	.5 percent
Cut and Fill Required	37,000,000 cu.yards	210 miles of cut and fill
Concrete Required	5,000,000 cu. yards	
Steel in Bridges & Structure	100,000 Tons	
Tunnels	66	
Total Length of Tunnels	42 miles	25 miles
Number of Bridges	3000	
Length of Bridges	35 miles	6.8 miles
Longest Bridge	3960 feet	
Elevated Railway on Concrete	71 miles	
Total Cost of Construction at Exchange Rate of $1 = 360 yen	$1 billion	$1.5 billion
Estimate of similar construction cost in U.S. with 12 new passenger stations, 360 passenger cars, etc.	$3.5 billion	

*The Keystone Corridor as conceived in the WABCO report would have two medium-speed tracks and two high-speed tracks.

Construction Program

Initiated acquisition program	April 1959
Right-of-way acquisition time	1-1/2 years
Length of longest tunnel	4.9 miles
Time required to complete longest tunnel	3 years
Roadbed and structures	2 years
Track laying, signal installation	1-1/2 years
Project completed - first commercial run	October 1, 1964

INVESTMENT

The estimated investment of $1.5 billion is a rounding off of the $1.451 billion figure computed in the WABCO study. The figure includes costs of the right-of-way planning and engineering, cuts and fills, bridges, tunnels, signals, four tracks, and some yard development work, over a distance of about 300 miles from the Ohio border to Parkesburg in Chester County. The cost with two tracks on a roadbed capable of carrying four tracks would be only slightly less than the cost with the four tracks. However, if the roadbed and tunnels were constructed only wide enough to hold 2 tracks, then construction costs would be considerably lower. The latter alternative would have a total investment cost of about $1 billion. The major elements of the investment are in tunneling and preparing a smooth roadbed by cut and fill techniques. Tunneling alone would cost about $10 million a mile a total of about $250 million with a four-track arrangement.

COST ESTIMATE* FOR TWO ALTERNATIVE DEVELOPMENTS ON THE KEYSTONE CORRIDOR

($ millions)

Cost Element	Two Tracks, Single Tunnels and Bridges		Four Tracks, Duplicate Tunnels and Bridges	
Planning and Engineering	$25		$25	
Land Acquisition*	23		23	
Landwork	646		1002	
Subtotal Roadbed		694		1050
Maintenance shop, yards, etc.		115		125
Trackage, Signals, etc.		138		276
Total Investment		$947		$1451

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*Assumes use of existing right-of-way from Harrisburg to Philadelphia with track and roadbed improvements between Harrisburg and Parkesburg (in Chester County). The distance between Parkesburg and Philadelphia is about 40 miles.

Source: Westinghouse Airbrake Company

The $1.5 million estimate made by WABCO appears to be a little low in comparison with the estimated cost of construction of a "Tokaido Line" in the U.S. However, there are some good reasons why the figure is lower. First, the Keystone Corridor, as envisioned by WABCO, would be developed over raw land from the Ohio border to Harrisburg. The track from Harrisburg to the New Jersey border would be either laid over existing right-of-way or else be the same track, but more securely fastened to the rails. Thus, a considerable cost saving would result where construction costs would be highest. Also, the cost of the Tokaido Line included the purchase of 360 passenger cars and construction of 12 new rail terminals. Considering these additions to the Tokaido Line, the WABCO construction cost estimate seems well within reason.

If the 110 to 120 miles of right-of-way between Harrisburg and Trenton also is purchased, as has been suggested, then that extra cost for an alternative leg of the Corridor should be included in the total investment. The estimated right-of-way cost of $23 million was made by WABCO for 180 miles at about 50 acres of land per mile at a purchase price approximately $300 per effective acre. Using these figures as a guide and knowing that land to the east of Harrisburg is considerably more expensive than land to the west, it is conceivable that the right-of-way between Harrisburg and the New Jersey border at Trenton could cost over $100 million.

The investment costs considered do not include any purchases of rolling stock. It is assumed that a transportation company or individual shippers will buy or lease cars to place on the tracks. The PennDOT preferably would lease the tracks or right-of-way to a transportation company who would also maintain them.

Depreciation would be charged against rails and signals. All other acquisitions and improvements would be considered non-depreciable land.

OPERATING EXPENSES

Hopefully the PennDOT would not have to become involved in the daily operations of the Corridor. The PennDOT preferably would charge a lessee only a fixed fee per year or a rate based on the number of cars or weight of cars moved across the Corridor. Likely a lessee would prefer some variable charge based on movement. This would reduce his risk.

A PennDOT should schedule a payoff of the investment in a Keystone Corridor project over a reasonable period of years. The revenues for payoff would hopefully come from the lease arrangements on Corridor operation. This would allow more freedom at a later date to make additional transportation improvements. If the target were a payoff of $1.5 billion principal plus interest (at 5%/year on the unpaid balance) averaged for equal annual payments over a period of 25 years, the total requirement would be $2.415 billion. With allowance of $600 million for contingencies and inflation, the annual revenue requirement would be about $120 million/year to make payments. This compares with a rate of depreciation and amortization of deferred assets at $64 million/year on the New Tokaido Line in Japan (including depreciation on rolling stock), and payments of about $67 million/year for "interest and liabilities" (all at the conversion rate of 360 yen per dollar (the above figures were provided by Mr. Tock Shima, General Manager, New York Office, Japanese National Railways).

The variable costs of operation presumably would be incurred by a lessee of the Corridor. These costs are relevent because they give some indication of the extent of revenues which could be extracted from the lessee by PennDOT to pay off principal and interest on revenue bonds.

One way to estimate the operating cost per rail car which moves across the Corridor is to assume that it is the same as the corresponding cost for moving a car across the Tokaido Line in Japan. This is a reasonable approach (with some adjustment) because it reflects actual costs over very nearly the same track conditions and same distance as the Keystone Corridor between Ohio (Pittsburgh Area) and New Jersey (Philadelphia Area).

The total operating cost for the Tokaido Line during the first six months ended September 30, 1967, was 10.783 billion yen.(Table H-3). If we assume that the annual operating cost would be twice the six-months figure, the result is 21.566 billion yen per year (indludes all costs except interest and depreciation). By converting yen to U.S. dollars at the current exchange rate of 360 yen per dollar, the annual operating expense of the Tokaido Line becomes $59.9 million. However, if we are to consider operation in the U.S., we must make still another adjustment to reflect differences in wage scales. The adjustment was made using a factor of 3.7 to convert cost value per dollar in Japan to cost value per dollar for the same operation in the U.S. The 3.7 factor is the 1965 ratio of average monthly wages earned by railroad workers in the U.S. to the average month-

Table H-3
Cost of Operating The Tokaido Line

Element of Operation	Actual Costs, 6 Months Ended Sept 30, 1967 (millions of yen)	Estimate for the Year (millions of yen)	Conversion (millions of U.S. dollars)*	Adjustment Factor (3.7)**	Adjusted Cost
Personnel Expense	2,036	4,072	11.3	3.7	41.9
Motive Power Expense	1,940	3,880	10.8	3.7	40.0
Repairs Expense	4,557	9,114	25.3	3.7	93.5
General Expense	2,250	4,500	12.5	3.7	46.3
Total Expenses (less depreciation and amortization)	10,783	21,566	59.9	3.7	221.7

Rail cars crossing in 1967 = 525,000 (60 cars each way every day)

Estimated operating cost per car crossing = $221.7 million/525,000 cars = $420/car adjusted to the U.S. labor costs in the transportation industry

Estimated operating cost per car crossing = $175.4 million/525,000 cars = $334/car, with deletion of General Expense

Estimated operating cost per car crossing = $146.2 million/525,000 cars = $276/car, with no upward adjustment in exclusive of general expenses and with no scale up for power costs

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*Conversion at 360 yen per dollar

**Ratio of average 1965 monthly wages paid U.S. railroad employees to average 1965 monthly wages paid to Japanese people employed in transportation, communication and storage areas.

Source: Japanese National Railways

ly wages of Japanese employees employed in the transportation, communication and storage industry in Japan (adapted from The Yearbook of Labor Statistics, International Labor Office of Geneva, 1966). The result in adjusted operating cost of running 1440, 82-foot, 170,000 pound cars a distance of 320 miles daily for one year is $221.7 million.

In actuality the cost is somewhat overstated if we are to compare movements which constitute chiefly freight on a Keystone Corridor. For example, Japanese National Railways maintains a total of 12 large modern stations on the Tokaido Line. The Keystone Corridor route would have only three passenger stations, Pittsburgh, Harrisburg, and Philadelphia. Furthermore, the Tokaido Line is used for passenger service only. This means greater expenses in serving food, etc. Thus, both Personnel Expenses and General Expenses are probably overstated considerably. If we delete only the General Expenses (which presumably are chiefly overhead expenses) the new adjusted average expense is $334/car. Furthermore, by deleting General Expenses, we somewhat compensate for including in Repair Expenses the cost of repairs to expensive coaches, railway stations, etc., which would not represent amjor expenses on the Keystone Corridor. A final adjustment applies to Motive Power Expense. We applied a factor of 3.7 to Motive Power Expense in order to adjust it to U.S. levels. This factor adjustment perhaps was high for power rate conversion. The factor represented equivalent purchasing power of the dollar by labor in each county. The cost of power in Japan may be as high or higher than our cost for the same kilowatt-hours basis because Japan must import more than 3/4 of its power requirements in the form of coal and oil. Exports of coal from the U.S. to Japan amounted to 7,491,000 tons in 1965 (Minerals Yearbook 1967). Thus if we assume that power costs would be equivalent in the U.S. and Japan, we could further reduce the total cost of operation of $144.8 million/year or $276/car.

The implication of the above costs per car is that if high-speed across a Keystone Corridor existed today, the average rail car could likely be brought across the State at a variable cost of less than $420/car. A more likely trans-Pennsylvania variable cost would be about $276/car.

In order to give meaning to the variable costs, let us assume further that two trucks or two containers could ride on a flat car across the State on the Corridor. The terminal to terminal cost for such a movement would be under $210/trailer. A best estimate is that a high speed movement on the Keystone Corridor between Pittsburgh and Philadelphia would show a variable cost of about $138/ trailer ($\frac{\$276/\text{rail car}}{2}$ = cost per truck trailer or cost per container).

SOCIAL AND ENVIRONMENTAL COST

The purchase of right-of-way for a Keystone Corridor would likely split many properties. Farms would be divided, property values would fall wherever splits occurred. The only properties which would show increases in value would be those near terminals or spurs (where, for example, recreation developments might take place. Many properties would be removed from the tax roles.

The Keystone Corridor would draw each end of the State closer together, but its east-west polarity would only be detrimental to central Pennsylvania's growth unless some development, such as a "new city" were built around a central rail station in the middle of the State. If too many stops are provided across the State, however, the effect of high cruising speed is lost.

Another dilemma is that of helping industry in bordering States as much as or more than Pennsylvania industry by constructing a high-speed track across the State. All State funds spent on constructing a track and perhaps subsidizing it would have direct benefits to Ohio and New Jersey companies as well as Pennsylvania companies. For example, metal fabricators in Ohio could more readily send their finished and semi-finished goods to New Jersey markets than would be the case without construction of the Corridor tracks. Approximately 75% of the rail traffic which traverses the State has origins and destinations outside of Pennsylvania. For this reason, it is justifiable to ask for substantial support from U.S. DOT in constructing any high-speed thoroughfares across Pennsylvania.

A third objection to the Corridor might be the effect of elevated tracks in walling off sections of cities which it would serve. Everyone is familiar with the "wrong-side of the tracks" syndrome which can be created by construction of an artificial barrier.

A fourth non-quantifiable cost is the loss of truck driving jobs which would result from the efficiencies provided by the long-haul on the rails. Truck drivers would only be needed at each terminal to make local deliveries. There would be little change in railroad employment. Thus, there would be a net loss of jobs. However, this is a criticism of any labor saving device.

Benefits of a Keystone Corridor

The benefits of the Keystone Corridor can be conveniently analyzed according to nine categories: Capacity, Speed, Cost Saving and Efficiency, Industrial Development, Recreation and Tourism, Safety, Comfort and Convenience, Land Use, Aesthetics and Social Improvements. The following are discussions of the nine categories of benefits as they apply to a Keystone Corridor.

CAPACITY

The construction of a Keystone Corridor would give greater rail capacity across the state. Unfortunately, capacity already abounds on the through tracks of most railroads. The switch yards and unloading points are the capacity-limited areas in railroad operations.

> "Unutilized railroad capacity is a chronic problem which demands effective steps to retain existing traffic and to attact additional traffic. Moreover, railroad investments in recent years which were intended for modernization and greater efficiency have in many instances also increased capacity, although this has not usually been the purpose....realization of the potential economics of these and other interrelated improvements depends on large and increasing traffic volumes".

-A Guide To Railroad Cost Analysis,
Association of American Railroads,
December 1964.

If we assume an average speed of 80 mph, with 10 minute headways, and 150 railcars per train, with an average of 20 hours of operating time per day, the theoretical capacity of two medium speed tracks would be about 36,000 cars per day. If we assume an average speed of 130 mph with 5 minute headways, and with 75 rail cars per train, with 20 operating hours per day, the theoretical capacity of two high speed track would also be about 36,000 cars per day. Thus, the combined theoretical capacity of two medium-speed, and two high speed rails on the Keystone Corridor would be approximately 72,000 cars/day, or 26,300,000 cars/year. Thus, the capacity with four high-speed rails would be the same as with two medium and two high-speed rails under the WABCO assumption.

The 10 minute headway assumption for medium speed trains corresponds to that of the WABCO report (Keystone Corridor Systems Analysis, Volume III, pg. 66) in that they assumed 10 minute headway for locomotive powered freight trains at a cruising speed of 90 mph. Further support to 10 minute headways was given by Klauder & Associates who prepared Section 3 of the Statewide Transportation Inventory (TAC Project 4, Statewide Inventory, Wilbur Smith & Associates, 1968).

They assumed approximately 10 minute headways in estimating capacities on the Main Line of the Penn Central between Harrisburg and Philadelphia. A headway of 10 minutes would allow about 10 to 12 miles spacing between the caboose of one 80 mph train made up of 150 cars, and the engine of the next train. At an average speed of 130 mph; 5 minutes headway would allow slightly less than 6 miles spacing between caboose of one 75-car train and engine of the next 75-car train. WABCO assumed 5-mintue headways for 150 mph freight trains. This is consistent with the specifications of the New Tokaido Line in Japan. It has 5-minute headway capacity for 130 mph passenger trains.

While the line capacity is obviously large, the existing terminal capacity is relatively small. A revolutionary new technique for high-speed recognition, switching and transfer would be needed at each terminal in order to handle 26,300,000 cars per year. However this number far exceeds the market range of rail cars expected (200,000 to 500,000 per year) on a Keystone Corridor. Furthermore, the capacity exceeds by a factor of 10 the maximum number of rail cars expected on a freight oriented system even if non-premium rates were charged and even if all trans-Pennsylvania movements were switched from the Pennsylvania Turnpike to the Keystone Corridor.

FASTER SPEED

The only railroad tracks which traverse the state in east-west directions are those of the Main Line of Penn Central Railroad. The average speed of freight movements on the Penn Central Railroad's Main Line between Pittsburgh and Philadelphia is now about 30 mph with no stops (Table H-4). By contrast, the proposed initial cruising speed on the relatively level tracks of the Keystone Corridor would be 90 mph. The design calls for an increase to 150 mph on a second pair of high-speed tracks to be layed after the first pair of tracks capture as much as possible of the freight in the slower speed category. This compares best with "door-to-door" freight movement by truck at about 40 mph (Maraist, et. al., FIRL, 1967). However, inter-city truck movements are becoming faster with the advent of more powerful equipment and completion of the Interstate Highway system.

The design specifications do not seem to be overly ambitious. Certainly, it is well within existing technological capability to run trains up to 150 mph. Japan National Railways reportedly has plans for increasing the cruising speed of its express trains from 130 mph to 150 mph in 1970 ("Formula for a Brand New Speedster", Trains Magazine, April 1966). In the United States speeds exceeding 150 mph have been accomplished on test tracks by the United Aircraft Train and the Penn Central Train, both of which are to run on the Northeast Corridor

TABLE H-4. EXISTING TRACK AND TRAVEL CHARACTERISTICS ON THE PENN CENTRAL RAILROAD MAIN LINE BETWEEN PITTSBURGH AND PHILADELPHIA*

City Pairs Served	Link* Designation	(A) Maximum Uphill Grade (Percent)		(B) Length of Maximum Uphill Grade (miles)		(C) Number of Curves	(D) Length of Curves (miles)	(E) Length of Link (miles)	(F) Minimum Travel Time 1st Class Trains (hrs.-min)		(G) Average Travel Time of Freight Trains (hrs.-min)		(E)/(F) Average Speed of Fastest 1st Class Trains (miles/hr.)		(E)/(G) Average Speed of Freight Trains (miles/hr.)		(D)/(E)x100 Percent of Track Which is Curved (percent)
		E.	W.	E.	W.				E.	W.	E.	W.	E.	W.	E.	W.	
Pittsburgh - Johnstown	9.11.2	1.0	1.0	4.0	5.0	79	25.6	68.0	1:33	1:30	2:29	1:55	44	45	27.4	35.4	37.8
Johnstown - Altoona	9.16	1.59	2.10	6.0	4.5	64	12.3	39.0	0:56	1:05	2:01	1:33	42	36	19.4	29.3	31.6
Altoona - Harrisburg	9.18	.18	.55	2.9	2.0	140	87.4	131.5	2:16	2:15	3:49	3:35	58	59	34.5	36.7	66.5
Harrisburg - Lancaster	9.24	.84	.75	7.2	35.0	22	7.8	36.0	0:35	0:38	1:12†	1:16	62	57	30†	28.4	21.6
Lancaster - Thorndale	9.32	.56	.57	6.2	5.7	17	7.5	33.0	0:27	0:32	0:49†	0:54†	73	62	40†	37†	22.7
Thorndale - Philadelphia Zoo	9.40.1	.55	1.50	10.0	8.2	27	8.4	31.8	0:37	0:39	0:57†	1:00†	52	49	33†	32†	26.4
Philadelphia - Pittsburgh ‡	-	-	2.10	-	35.0	349	149.0	339.3	-	6:39	-	10:14	-	51	-	33.1	44.0
Pittsburgh - Philadelphia‡	-	1.59	-	10.0	-	349	149.0	339.3	6:24	-	11:19	-	53	-	29.9	-	44.0

*Source: Statewide Inventory, Wilbur Smith and Associates, 1968, pp. 3D-24, 25, 26, 28, 32.

†Estimated by FIRL.

‡Assumes that there are no stops en route.

tracks starting in 1968. There is some indication that 150 mph is a practical upper limit for economical and safe ground speed of cars supported on rails. At speeds over 150 mph, hover trains on concrete (sometimes referred to as ground effects machines) seem to offer more reliable and economical operating characteristics (New Technology, Appendix A). However, existing roadbeds and rails might be used to guide such craft with only minor modification.

Considering the relatively short distance between Pittsburgh and Philadelphia (about 300 miles by either Pennsylvania Turnpike or by way of the proposed Keystone Corridor) there could be some question about the competitivene-s of rail-truck (TOFC) or rail container (COFC) movements as opposed to door-to-door truck deliveries between the city pairs. Figure H-1 shows graphically the comparison between hypothetical moves across the State by truck and by TOFC/COFC based on an assumed 2 hour delivery time to and from the terminal for TOFC/COFC movements. Note that under the assumptions used, the truck averages 50 mph door-to-door and offers a door-to-door time saving of 1 hour and 20 minutes over the moderately fast train cruising at 90 mph, but will approximately break even on door-to-door time with the high speed train (cruising at 150 mph). This would suggest that moderate speed on the Corridor would have no significant advantages over truck delivery except possible cost savings.

Although both 90 mph and 150 mph cruising speed provide considerably faster service than present passenger trains which can average in excess of 50 mph on non-stop runs across the State on existing tracks the time savings may not be significant to shippers.

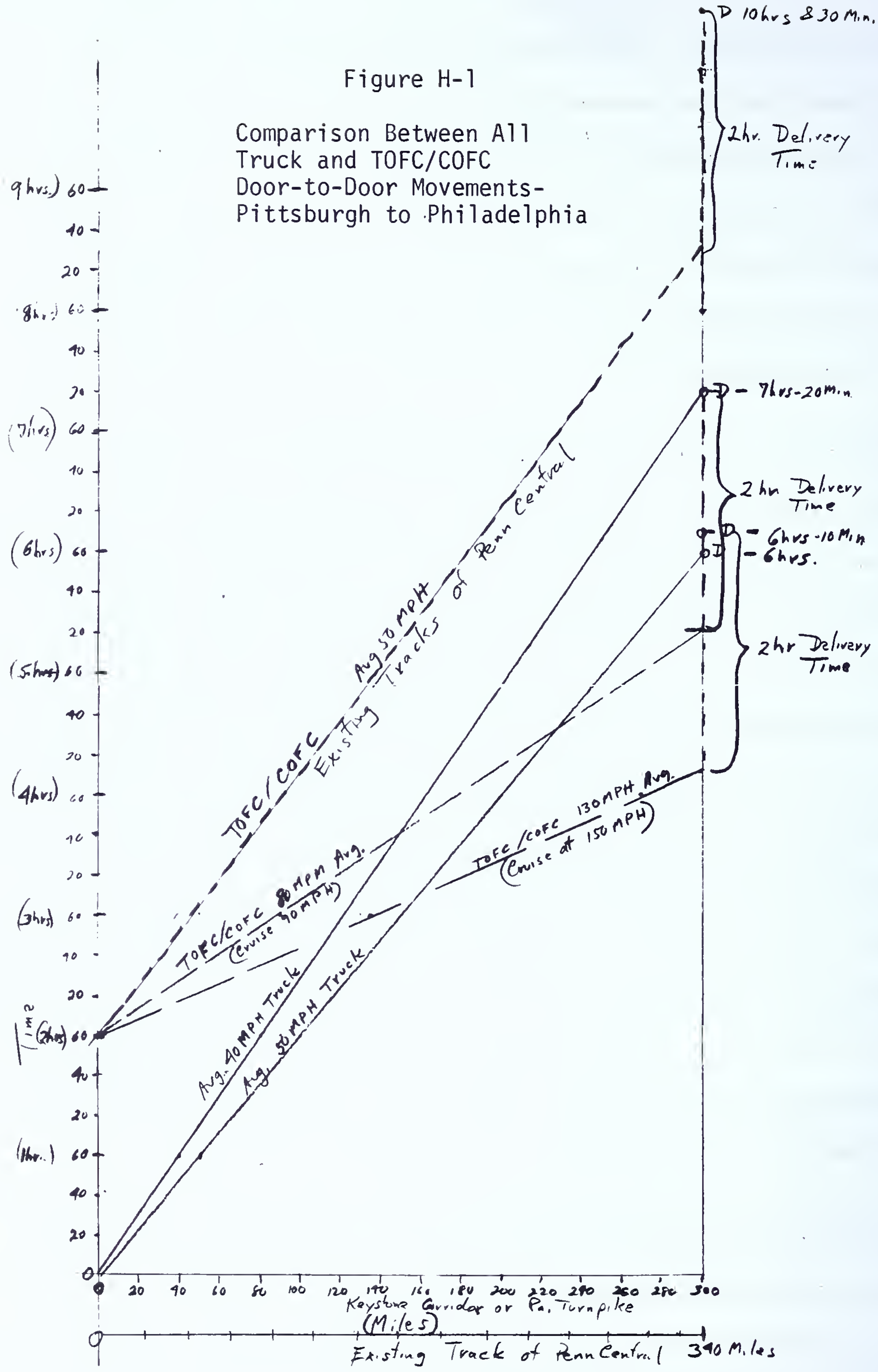

Figure H-1

Comparison Between All Truck and TOFC/COFC Door-to-Door Movements- Pittsburgh to Philadelphia

Figure H-1 points out the importance of fast handling at the terminals. If terminal efficiency is not outstanding, then all of the speed gained on a Keystone Corridor is lost. The important thing to consider is that many shippers want over-night delivery. They want to send out shipments at 4:00 P.M. and have them arrive at destination points by 10:00 A.M. the next morning at the latest. Otherwise, the shipments may as well be two days in transit. The reason for this preference is likely one of the requirements for scheduling incoming materials into the day's production run. This gives effectively 18 hours of time between Pittsburgh origin and Philadelphia destination or vice versa for pickup and delivery. If the train ran on existing tracks at 50 mph between Pittsburgh terminal and Philadelphia terminal, the terminal-to-terminal time would be 6-1/2 hours. This schedule would yield over 5 hours at each end for delivery to the terminal or delivery from the terminal under optimum conditions. The advantage of high rail speed would be in giving truckers more time at each end to pick up and make deliveries. This would help level off the peak period demand for trucks, somewhat, in the morning and evening, but it would not solve the complicated problem of how to move materials swiftly through the terminals. Thus, the conclusion is that investment directed toward improving the speed of handling at terminal facilities should take precedence over any actual construction work on the Keystone Corridor. Furthermore, a relatively straight route across the State would not have great meaning for moving freight, but could make the ride more comfortable for passengers. Thus, if the initial emphasis should shift to moving passengers, then it could be advantageous to move them at 150 mph rather than 90 mph. The technology for moving passengers at 150 mph+ by rail is already available.

COST AND SAVING EFFICIENCY

The optimum Keystone Corridor route would be about 80% as long as the existing route of the Penn Central Railroad across the State. In addition, the Corridor's specified maximum gradient of .5% would lower power requirements as compared to power required to scale steep grades on the existing Penn Central Main Line track. One grade between Harrisburg and Pittsburgh is 2.10% and runs a distance of 4.5 miles (Table H-4). This and other impediments on the route create great barriers to sustained fast through-speed and considerably increases fuel and power requirements for trans-Pennsylvania movements. For example, 150 horsepower can move a 50-ton rail car at a maximum sustained speed of 60 mph on a .5% grade, but only 23 mph on a 1.5% grade (Engineering and Economic Study of High-Speed Freight Train Service, Maraist, Stone, Happel, FIRL, 1967).

The indirectness of the existing Penn Central Main Line across Pennsylvania is readily indicated by the 349 curves between Pittsburgh and Philadelphia (Table H-4). Furthermore, 23 of the curves are greater than 6^o in severity and 83 of the 349 curves are 3^o to 6^o. This compares with a maximum of $.5^o$ curvature for the proposed Keystone Corridor route.

NK DESIGNATION*	CURVES GREATER THAN 6°		CURVES 3° TO 6°	
	Number	Miles	Number	Miles
11.2	4	1.0	20	3.1
16	12	1.8	27	4.5
18	6	1.3	29	19.0
24	1	0.1	1	0.1
32	0	0	2	0.8
40.1	0	0	4	4
OTAL	23	4.2	83	27.9

*Source: Adapted from State Inventory, Wilbur Smith and Associates, 1968, pp. 3D-24, 25-26, 28, 32.

The existing 340 miles of track between Pittsburgh and Philadelphia compare with a straight line distance of 252 miles (Table C-2) and about 292 miles over the Keystone Corridor's optimum route (WABCO, op. cit.). The road distance between downtown Pittsburgh and downtown Philadelphia via the Pennsylvania Turnpike is 305 miles (Table C-2).

The average time for a non-stop passenger train in transit over the 340 miles of track between Pittsburgh and Philadelphia is about 6-1/2 hours (See Table H-4). When considering the border-to-border distance across the State, the Keystone

Corridor route should show an effective mileage saving of about 15% over the existing route of the Penn Central. (WABCO op cit.). At an average speed of 80 mph, the time in non-stop transit between Pittsburgh and Philadelphia would be slightly over 3 1/2 hours. Thus, the Keystone Corridor would initially save about 3 hours over the capabilities of the existing Penn Central tracks. With cruising speed of 150 mph (Phase II of Keystone Corridor development) and average speed of 130 mph, the time saving over the existing Penn Central capability would be about 4 hours and 15 minutes. The non-stop travel-time of 2 hours and 10 minutes between Pittsburgh and Philadelphia under the Phase II development program should make the Keystone Corridor competitive with air transport between Pittsburgh and Philadelphia. The relatively short air transport distance between the city pairs limits the effectiveness of higher speeds by fixed wing aircraft. V/STOL aircraft could still have some advantages over the high-speed trains on the Corridor for passenger transportation, however. This would be particularly true if they should land at heliports in suburban areas far removed from the train stations.

There are no known plans for drastically changing the route of the Pennsylvania Turnpike. The 305 road-mile distance between downtown Pittsburgh and downtown Philadelphia will likely remain essentially the same past 1975 (Table C-2).

The total time required to drive on the Turnpike between downtown and Pittsburgh and downtown Philadelphia will be reduced somewhat by the widening of tunnels. However, the estimated current driving time by auto of 5 hours and 25 minutes will not be significantly changed by tunnel improvements. Thus, a high-speed rail line (150mph) on the Keystone Corridor should be able to offer significant time advantages over the existing railroad tracks and roadways between Pittsburgh and Philadelphia which could have significance for passenger movements.

INDUSTRIAL DEVELOPMENT

The construction of a Keystone Corridor would draw Pittsburgh closer to the metropolitan markets of the east coast. The access to high-speed freight service could influence plants in Pittsburgh to locate and to manufacture products which require fast delivery. Such products are usually high in value per unit weight. By contrast, on the east coast the rapid decrease in land available for such manufacture, along with the prevailing comparatively high wage scale is inducing flight toward the hinterlands for manufacturing operations. Scranton, Wilkes-Barre, and Williamsport are examples of towns which are beginning to benefit from the flight of manufacturing operations from the east coast (Table D-3). The Keystone Corridor could help jump the gap across Pennsylvania to the Western side of the State and influence future plant locations.

If the Keystone Corridor rails were tied in with those of the Northeast Corridor, then Pittsburgh's service industry should benefit. The service industries rely on transportation facilities for rapid movement of people who have the ideas and talents which are in demand. The demand for services is increasing much more rapdily than the demand for manufactured products. Thus, the Corridor could provide high-speed transport of people from Pittsburgh to the U.S. major markets for their services--New York, Washington, D.C., Philadelphia, and Boston.

Philadelphia, Harrisburg , and Pittsburgh could benefit greatly from construction of the Corridor if terminals were built in those towns to receive and efficiently process the great volumes of freight which would be expected. There should be opportunities for employment in break-bulk and stuffing operations for LTL and LCL movements.

Also, land near the terminals should have premium value for industries which demand central warehousing and fast delivery.

Perhaps, Olmsted State Airport at Harrisburg could become the principal receiving and shipping point for international freight on the east coast if its freight-handling terminal were tied in by rail to the major cities of Megalopolis. By the late 1970's, air space over the great east-coast cities and ground space available for parking airplanes could become so limited, that the major city airports would be reserved primarily for passenger service. Even now, air freight movements at major airports are often restricted to the late night hours so that they don't interfere with daytime passenger service. The use of Harrisburg's jetport would allow daytime air-freight arrivals and departures with fast delivery to the New York-Washington, D.C. population complex.

Other industrial development opportunities would include those associated with use of a median strip between the rails. The median could be used for power lines, pipelines, communication lines etc. The linear path could eventually have great utility for communication developments, such as "laser transmission" which require straight line enclosures. Eventually, the communications transmission function of the Corridor could become as important as its transportation function.

RECREATION AND TOURISM

Perhaps short rail spurs could be built of the Keystone Corridor rails to those lakes which merit the greatest development effort. It would also be helpful if there were potential for building ski resorts next to the lake complexes. With year around attactions, small scale versions of Sun Valley, Aspen, or Vail might be built around a rail terminal point. This would allow visitors from New York and Washington to come to Pennsylvania for recreation weekends without the necessity of driving many miles. Skiers, in particular, would be favorably impressed with the opportunity to travel quickly to ski slopes by rail when driving would be hazardous.

Since higher elevations would be desirable for location of resort development, it would be sensible to study the elevations on the proposed Keystone Corridor to determine where a short rail spur might be built to support resort activities. A preliminary estimate is that the highest altitudes on the proposed Corridor would be from eastern Bedford and Blair counties across Somerset and Ambria counties. Maximum elevations in that area are well over 3000 feet above sea level. Several ski resorts are already located there. The potential for further recreation development is evidenced by the fact that Seven Springs, Blue Knob and Spring Mountain Ski slopes, all located in the designated area, now draw large crowds from Washington, D.C., and Pittsburgh.

Other states are beginning to realize the value of tourism in maintaining high levels of employment in rural areas. Vermont's economy is very much tied to tourism. New York state has recently made great investments in development of ski slopes which are now also state operated and state maintained.

A secondary effect on tourism could be created by the formation of lakes by land fill associated with construction of a Keystone Corridor system. The lakes could provide strong attractions for tourists and neuclei around which to build new State parks. Surprisingly, even though there is much running water in central Pennsylvania, there are relatively few lakes. Of course, roads would have to be constructed to provide access to the lakes in most cases.

SAFETY

Any high-speed transportation presents possible safety hazards. Nevertheless, most people seem to put aside thoughts of accidents and travel at the highest speeds which they can afford, e.g., purchase of high-powered cars and airplane tickets to far away places. At any rate, the Keystone Corridor system should be constructed so that the safety hazards are minimized. This means elevating the roadbed in heavily populated areas, fencing off the rails throughout the length of the track, and eliminating all road crossings. The potential for safety at high speeds(100 mph +) is much greater by rail than by any other mode of transportation.

COMFORT AND CONVENIENCE

The Corridor rails could provide a very smooth and enjoyable ride for passengers. Use of high-speed cars similar to those to be used on the Northeast Corridor should present a very comfortable ride on a Keystone Corridor track which would have only very slight and gradual changes in direction and elevation. Sway, one of the great discomforting characteristics of existing low speed cars should be eliminated on the Corridor rails. The comparable Japan National Railroad's Tokaido Line reportedly gives a very smooth ride at high speeds.

> "What's it like to travel at 130 mph by train? the answer: on the Bullet .... (of the Takaido Line) at least, not much different from riding on any other train at half the speed. ... The Bullet Train seemed to float serenely along with remarkably little noise or jostling and only the slightest hum from the spinning traction motors ("Formula For a Brand New Speedster," Trains Magazine, April 1966).

The convenience of passenger service on the Keystone Corridor would be unsurpassed by any other mode for those who had origins or destinations in Pittsburgh, Harrisburg, or Philadelphia. The Penn Central already owns land and trackage near downtown Pittsburgh which might be used for terminal operations. This would relate nicely to the tentative plans of the Penn Central to build a large "living complex" on their property in downtown Pittsburgh. The complex reportedly would include apartments, shops, and officers. A rail terminal would compliment such a development. (See plans of the Penn Central Railroad, Appendix D).

Harrisburg already has a well-used rail terminal. However, it is old and uncomfortable. The terminal should be returbished or rebuilt long before construction of the Corridor is completed to service passenger traffic between Harrisburg and Philadelphia. One alternative to consider is the construction of a new terminal near the Pennsylvania Turnpike and the new Olmsted State Airport. Such a location would have the advantage of avoiding downtown congestion. It could also serve other modes and offer more space for parking. The proximity of the Penn Central Main Line tracks to the terminal at Olmsted State Airport (about 100 yards) suggests that location as an optimum location for a rail terminal.

LAND USE AND ENVIRONMENTAL FACTORS

Many acres of Pennsylvania land could be enhanced in value by proper location and development of freight handling facilities. It would be preferable if land for terminal facilities were purchased with the right-of-way for a Keystone Corridor. If large quantities of land were purchased (perhaps a total of 1,500 acres near Pittsburgh, Philadelphia and Harrisburg) for development of freight terminals, then the land surrounding freight terminals could be developed and managed by the Pennsylvania Department of Commerce for location of transportation sensitive industries.

If the Keystone Corridor were split at Harrisburg, one leg running to 30th St. Station at Philadelphia, and the other to Trenton across lower Bucks County (WABCO op. cit.) then the land use influence could be intensified considerably. Conceivably, the right-of-way could be purchased in widths great enough to accomodate extra rails around which new towns could be built to the north of Philadelphia. The concept would be one of spacing new towns of approximately 10,000 each by several miles along the right-of-way which would be purchased for the northern leg of a Keystone Corridor. The fast inside rails would be for fast freight and through passengers. The outside rails would be for local passenger service and local deliveries. A linear off-shoot of Megalopolis could be directed toward Harrisburg.

AESTHETICS AND SOCIAL IMPROVEMENTS

The view across unspoiled central Pennsylvania should be dramatic for passengers on the Keystone Corridor. When the right-of-way for a Corridor is purchased, care should be taken to zone the land within near vision of the Corridor so that it is not surrounded by unsightly commercial development which would block or spoil the view. Improvement of rail facilities across the State should act as a bond, uniting eastern and western Pennsylvania.

The development of the Keystone Corridor with appropriate intermodal freight terminals would have a great impact on switching long-haul truck movements to local delivery out of rail terminals. Truck drivers would have safer jobs as compared with "pushing rigs" at high speeds up and down Pennsylvania's hills. Also the necessity for spending nights on the road and driving large trucks under conditions of great fatigue would be eliminated each time a trans-Pennsylvania truck movement is shifted from road to rail.

If cities are built along the right-of-way of a Keystone Corridor east of Pittsburgh and west of Philadelphia; then more people would have ready access to desirable open space but still have timewise proximity to the attractions of the large core cities.

Comparing Costs and Benefits

When all costs and benefits are weighed, the most obviously influential ones should be those associated with making a quick line haul at reduced cost when compared to the existing alternatives for transport. A cost range of $138 to $210 to move a trailer across Pennsylvania on the Keystone Corridor would compare with a variable cost of about $198 to move the trailer 305 miles via the Pennsylvania Turnpike between the same origin destination pairs (Downtown Pittsburgh and Center City Philadelphia were chosen to illustrate comparative costs only. The actual freight terminals would likely be removed from the downtown areas). The truck movement cost is derived form actual cost data provided by 1,217 intercity carriers in the United States (Trinc's Blue Book of the Trucking Industry, Trinc and Associates, 1967). The average for 1966 was $.65/vehicle-mile, less depreciation, terminal expenses, and administrative and general expenses. The average intercity haul for the group was 322 miles.

If we assume that the high rate of $210 applies to Keystone Corridor operations, then all freight which would have an origin in Pittsburgh and destination in Philadelphia or vice versa, would best go by truck unless some premium were placed on slightly faster delivery time. If the more likely estimate of $138 applies, then there would be a favorable differential of about $ 60 between rail movement and truck movements to cover charges for use of the

Corridor, for intermodal handling operations, and for making deliveries to or from the terminal at each end .

The lease payments required to meet principal and interest on a Keystone Corridor bond could amount to about \$3 billions over a period of 25 years ie., about \$120 million/year.

If all trans-Pennsylvania freight which now travels by Turnpike or rail, were to switch to Keystone Corridor rails and rail passenger volume increased by 50 times over existing volume (under conditions discussed in the first set of assumptious under Economic Viability) the total volume of traffic on a Keystone Corridor would be about 2 million rail cars annually. If the burden of paying off principal and interest were distributed equally among the movements, the average lease payment requirement would be \$60/rail car movement at a volume of 2 million rail car movements annually. This is the equivalent of \$30/truck trailer movement. A more probable volume of 500,000 rail cars per year on the tracks of the Keystone Corridor would yield a lease payment coverage requirement of about \$120/truck trailer. This amount when added to the \$138 variable cost of moving the truck trailer across the Keystone Corridor rails surpasses by \$60 the \$198 variable cost of moving the same trailer door-to-door over the Turnpike under the conditions assumed. Clearly, a premium charge would also be required to cover cost of terminal operations and local pick-up and delivery service.

The cost of terminal operations and pick-up and delivery service is difficult to estimate without knowing the exact location of the terminals.

However, it is interesting to note that one study(the Kearney Study) conducted in the Midwest in 1961 and updated by applying more recent cost data, placed the applicable cost of pick-up or delivery for TOFC operations at $17.50. The combined cost of pick up and delivery under such circumstances would be $35.00.

Terminal time costs 1.23 hours @ 6.50/hour	$ 8.00
Mileage costs 15 miles @20¢ mile	3.00
Driving time cost at an average speed of 15 miles/hour	6.50
	$17.50

Source: Merrill J. Roberts and Associates, Intermodal Freight Transportation Coordination: Problems and Potential, Graduate School of Business, University of Pittsburgh, December, 1966, and A. T. Kearney Company, Michigan Intra-State Motor Transport Costs, Michigan Public Service Commission, 1961.

The Kearney study found that the time required to load and unload a piggyback (TOFC) trailer was 1.23 hours as an average for his statewide study of such practices in Michigan. Since the truck driver was responsible for loading and unloading the trailer, there was no railroad charge for such activities.

Even though the 300 mile distance between Pittsburgh and Philadelphia may be borderline for high-speed rail freight service, because of high maintenance and fuel expenses, there is some indication that the distance is sufficient at conventional speeds for favorable cost advantages of TOFC/COFC over full doot-to-door trucking. After making a thorough analysis of special data developed by the Interstate Commerce Commission, Roberts at the University of Pittsburgh concluded: "TOFC's cost superiority is clearcut except for the very short hauls (at conventional speeds). Its advantage is generally asserted in all regions in the 200-350 mile range." (Interstate Commerce Commission, Bureau of Accounts, Rail Carload Cost Scales by Territories for the Year 1962 and Roberts, op. cit.). In the Eastern District, which included Pennsylvania, he found that the break-even distance between TOFC and truck operations was about 200 miles.

If the $35.00 cost for pickup and delivery applied, it would seem reasonable when compared to certain railroad charges for services. For example, the Penn Central Railroad charges $23.05 per car for diversion to another destination if the car is unopened and not rolling. (A rolling car takes a diversion charge of $11.13). The charge for demurrage, i.e., holding of the car, is $5/day after 2 days of free unloading time. After a charge of $5 for each of 4 days, the charge rises to $10 for the next 4 days and $15 for each day thereafter). However, there is some question about the validity of the 20¢/mile charge for short-haul movements which was an integral part of the calculation of the $35.00 pick-up and delivery cost.

One authoritative source shows average local delivery cost of $1.87/vehicle mile (adapted from Trinc's Blue Book of the Trucking Industry op. cit.), for shipments made by 300 local motor carriers who reported data to ICC for 1966 operations. The $1.87/vehicle mile includes the variable cost for drivers, fuel, and direct office support.

This matter of local delivery cost should be a subject of further investigation should a full-scale study of the feasibility of intermodal terminal construction be initiated.

Another suggested study associated with the feasibility of more efficient freight terminals would be an exploratory investigation of possibilities for speeding line hauls on existing rails and right-of-way.

Existing rail movements are very slow, averaging about 30 mph for trans-Pennsylvania freight shipments. Average line haul speeds across the State by truck are not much faster than those by rail. The distance across the State is too short, on the other hand, to justify extensive use of air transportation for moving freight. Better use of existing rails or use of a Keystone Corridor might fill a time cost gap in transportation alternatives for trans-Pennsylvania freight shipments.

The estimated line-haul variable cost for the several modes across Pennsylvania are as follow:

Mode	Variable Unit Cost ($/T-mi)	Pittsburgh-Philadelphia Distance (miles)	Line Haul Cost ($/Ton)
Air	.15	260	$39.00
20-T Truck	.0328	305	10.00
40-T boxcar (on existing Penn-Central tracks)	.0130	339	4.40
65-T coal hopper (on existing Penn-Central tracks)	.0099	339	3.35
40-T TOFC (on the Keystone Corridor high-speed tracks)	.0236	292	6.90 (excluding costs of terminal handling and pick up and delivery.)

Another technique for estimating possible revenues to a PennDOT from a Keystone Corridor operation is to consider possible revenues from passenger service on the Corridor. If the 76-passenger high-speed cars averaged 65% occupancy in crossing the State, then the 50 passengers on board would share a variable cost of $276 to $420, using again the Tokaido Line example. This would amount to $5.50 to $8.40 per person. An airline ticket for the same intercity trip costs about $20.50. If the entire differential between air fare and the fully adjusted operating cost of $8.40 per passenger were applied to paying $120 million per year on principal and interest of a bond, then 9.9 million trans-Pennsylvania passengers would be required annually to meet the obligation. This is over 33 times the number of passengers who flew between Pittsburgh and Philadelphia in 1966. (State Inventory, Wilbur Smith and Associates 1968). Even with 100% occupancy of rail cars moved at $276 per trans-State trip, the annual passenger volume would have to about 7.1 million in order to meet the goal of paying $120 million per year toward retirement of a Keystone Corridor bond. This is still almost 15 times the 479,000 passengers who rode the tracks between Pittsburgh and Philadelphia in 1966.

Clearly, any effort toward paying off a Keystone Corridor bond in 25 years by passenger service alone would require a change in transportation habits among those who now motor across the State on the Pennsylvania Turnpike.

At the present it does not appear that sufficient revenues could be generated from possession of a high-speed thoroughfare across the State to offset the high cost of construction. The existing tracks of the Penn

Central Railroad could carry freight at considerably faster speeds if shorter trains were run across the State. The Pennsylvania Turnpike and I-80 will serve fairly fast trans-State truck routes for some time to come. Even so, the combination of freight movement on the tracks of the Penn Central combined with local truck deliveries could be competitive. Both Pittsburgh and Philadelphia Airports are preparing for large volume movements of people. Thus, the conclusion is that many of the benefits to be provided by a completely developed Keystone Corridor can be provided by planned or existing transportation facilities in the immediate future, but not for the long-term, i.e., 20 years or longer when the air space near Pittsburgh and Philadelphia becomes crowded.

The possession of trans-Pennsylvania right-of-way, even in the central part of the State where land values are not changing rapidly, would add a thrust to the development of Pennsylvania which could have long-term positive benefits. The tie-in with the Northeast Corridor tracks would extend to the western Pennsylvania the advantages of time-wise proximity to New York's business and financial community and Washington, D.C.'s government services community. The eventual extension of the transportation system to Pittsburgh and beyond could then become one of the PennDOT's chief objectives.

The benefits to be derived from owning right-of-way are difficult to quantify. However, there are indications that purchase of right-of-way would have a greater economic return to the State than the interest cost of about 5% per year and the loss of tax revenues to the counties which it would traverse. The mere possession of right-of-way across the State could result in construction of linear cities out of Pittsburgh and Philadelphia. The linear city links could become segments of a new rail line across the State (or perhaps a trans-State hovercraft surface). The linearity of right-of-way would offer flexibility to the future development in technology. For example, any curved route would present problems for any conceivable vehicle which would carry passengers. It may be possible to build a high-speed freight conveying system in the future which could negotiate tight turns, sharp rises and falls. But, people of the 21st century will be subject to much of the same discomfort we experience in the 20th century, as a result of centrifugal force exerted on the body in a high-speed dip or sharp turn. Thus, of necessity, any high-speed ground transportation which can accomodate passengers should be as linear as possible. Also, a straight linear route across the State might eventually be used to support laser communication enclosures or other line of sight systems which carry many channels.

The alternatives to buying right-of-way, i.e., maintaining the status quo, likely would result in opportunity losses to the State. At the minimum, the State would lose some years in pursuing worthwhile goals such as attracting high-paying jobs to the State. With right-of-way purchased, a delay in construction might offer opportunities to take advantages of new cost-saving technology as it becomes available. For example, by 1990 it might be possible to drastically lower the current cost of $10 million per mile for tunnel boring in Pennsylvania. The gains to be recognized from tunnel boring efficiency could offset to some extent the inflationary upward pressure on other construction costs.

For an estimated $125 million, Pennsylvania could be the forerunner among the 50 states in buying right-of-way to prepare for the future.

Financing A Keystone Corridor

At the present, there are no federal government sources which could help finance purchase of right-of-way for a Keystone Corridor. Most likely a general obligation at bond issue would have to be floated to provide a source of funds for buying right-of-way. There is some chance that forthcoming "new town" legislation will provide funds for "access" which could include financing right-of-way for rails. Nevertheless, the prospects of obtaining funds from that source, even if legislation passes though Congress are too speculative to consider seriously.

Once land is owned, new opportunities are presented. Perhaps, a private transportation company or land development organization, such as a large well-financed U.S. corporation would complete the first leg of the Corridor as a part of a new town project, or perhaps the U.S. DOT could be purchased to build a test track or surface on right-of-way which would be on a segment of the Corridor. The selling point in the latter case would be that the test track could be used to test acceptance of new vehicles by actual passengers under real commuting circumstances in addition to testing the engineering and construction of the hardware. This is an important point because several government agencies have come under fire for neglecting the human aspects of hardware research. The legislation which authorizes potential funding of transportation demonstration projects is the "High-Speed Ground Transportation Study Act"; P.L. 89-220, 79 STAT 893 (See Appendix B for details). Funding is through the U.S. DOT only.

The folly in waiting for the appropriate federal government funding of projects is that such activities are erratic. It is preferable to set a course and follow it, picking up federal financing whenever possible. The states which are moving ahead the fastest in transportation development are doing so by issuing obligation and revenue bonds to finance their progress. The recent temporary cut-back in the interstate road building program as a measure to curb inflation is an example of the unreliability of federally administered funds. Perhaps the ownership of right-of-way across the State would provide the leverage needed to quickly obtain funds for building on the Keystone Corridor, in the event that there should be and severe recession during a period of low military activity. The construction on the Corridor would be a stimulus to the national economy during a time of need.

AN ADDENDUM TO THE KEYSTONE CORRIDOR ANALYSIS

Difficulties in Promoting Cooperation Between Railroads and Truckers

The cooperation that TOFC requires must be carved out of an intensely competitive market structure. (This is less true for the combination of barge-truck and air truck movements.) Hostility and distrust have characterized the actions of both rail and motor carriers, but the railroad's position of strength as line-haul carriers and ability to own their own trucks has made them less wary than the motor carriers. The attitude of distrust in motor carriers underlies the overwhelming popularity of piggyback plans II, III, and IV, which are offered solely by railroads under conditions in which they deal with customers rather than competitors. These three plans account for more than two-thirds of all piggyback revenues (Intermodal Freight Transportation Coordination: Problems and Potential, Merrill J. Roberts and Associates, Graduate School of Business, University of Pittsburgh).

Plan I, on the other hand, is a joint service offered only at the option of the railroads. Some railroads oppose it because of general animosity toward joint services; a number of others oppose it because they believe that it places trucks in a better competitive position than they would otherwise enjoy. Some roads offer Plan I when there is an opportunity to balance traffic or use capacity more effectively by participating in a motor carrier's business. Plan V, however, creates an entirely new set of industry alignments by arraying one rail-truck combination

Piggyback Plans

Plan	Originator	Who supplies equipment and transfer	Who delivers and picks up	Basis of rate
I	Motor carrier	Motor carrier; motor carrier loads and unloads trailer on railcar; rail carrier furnishes flatcars	Motor carrier	Motor carrier rates; blanket divisional basis for all freight in the vehicle (not on individual articles)
II	Rail carrier	Rail carrier	Rail carrier	Railroad commodity rates
III	Shipper or forwarder	Shipper or forwarder furnishes trailer (owned or leased); railroad furnishes flatcars, and transports and grounds trailers	Shipper or forwarder	Flat rate;
IV	Shipper or forwarder	Shipper or forwarder furnishes flatcar and trailer	Shipper or forwarder	Flat rate
V	Motor carrier	Motor carrier	Motor carrier	Rail carrier tariff for joint motor-rail rates

Source: National Transportation Policy, Report of the U.S. Senate Committee on Commerce by Its Special Study Group on Transportation Policies in the United States, Report No. 445, 85th Cong. 1st Sess., June 26, 1961, p. 674.

against other similar combinations in an effort to extend the market areas of the participating teams. Plan V is suitable to short-haul and regional carriers who, like railroads, find it an attractive device for opening up new territories.

In general, trucking companies, particularly the long-haul carriers have feelings of animosity toward TOFC and COFC and a few objective reasons for not using it, such as cost, service, and labor factors. They fear becoming too dependent on railroads, believing that it makes them vulnerable to increased charges, deterioration of service, and loss of customers.

Even the railroads, which appear to have the most to gain from TOFC and COFC movements, have been apprehensive about fully adapting to the potential volume of business. Generally, the railroads establish TOFC and COFC rates which are intended to discourage coordination with truckers. Furthermore, the rates are designed to prevent diversion of boxcar traffic to TOFC or COFC in order to maintain utilization of the many old but still serviceable boxcars which many railroads still own or use under long-term lease. The general resistance to moving fully into intermodal service is shown by the fact that no railroads have invested heavily in efficient trailer and container handling facilities as have several steamship companies (Although the management of the former NYC RR might take exception to the statement, it is yet to be proven that their Flexivan service has reached the efficiency which it is capable of offering with more frequent departures and faster unloading).

Strangely enough, even though there have been clashes between railroad and motor carrier managements which, to a great extent, retarded the coordination of the two for long-haul movements, both seem to recognize that TOFC's and COFC's potential savings will overcome resistances. The Association of American Railroads expects that by 1975 as much as 20 percent of all carloadings will be piggyback, of which about 50 percent will be containerized (Burton N. Behling, "Factors in Future Development of Rail Piggyback, Highway Research Record No. 153, 1967). The American Trucking Association likewise believes that piggyback shipments will increase (See Allan C. Flott, "Effect of Piggyback Operation on the Volume of Highway Truck Traffic," Highway Research Record, No. 153, 1967). Some of the forces influencing a trend toward cooperation between railroad and motor carrier are the commitment to containerization by the maritime industry and the advent of the Jumbo Jet (Boeing 747). The existence of great numbers of containers will awaken shippers to the advantages of containerization. Most often, the best way to move containers over land is by truck for the short-haul and rail for the long-haul. The Jumbo Jet will have the capability of dramatically expanding air freight capacity and lowering costs. While the airplane may never be able to capture a large percentage of the freight movement on a weifht basis from the truckers, it can capture the most lucrative business for movements of over 800 miles. One recent estimate placed air transportation's share of ton-miles at 0.1% of the U.S. total, but showed air as capturing 13% of the revenue spent on transportation of freight (Farris/McElhiney, Modern Transportation: Selected Readings, 1967). The implication is that the long-haul trucker will not be able to compete with air freight for high-value cargo. The most obvious retaliation would be a strong truck-rail alliance to offer competitive times of delivery at substantially lower cost. The railroads should also be interested in combating air freight in view of the fact that they and the motor carriers have already lost all of their lucrative transport service for first-class government mail. The U.S. Post Office has announced plans to send all U.S. Government first-class mail by air.

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